AMERICAN MACHINIST

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Gray's Boring and Facing Machine.

The engravings, herewith presented, represent a new machine, designed and built by the machine tool firm of G. A. Gray, Jr. & Co., Cincinnati, O., for boring and facing cylinders, pillar blocks, engine frames, &c., and especially for steam pump centers which have to be faced and bored for piston-rods and tapped for stuffers at both ends. These operations are intended to be performed with one setting of the piece.

The machine consists of two heads facing each other, one stationary and the other adjustable like the tail-stock of a lathe, mounted on a bed-piece. Each head has a heavy steel spindle, bored true from end to end, through which a spindle is fitted to traverse. The main or hollow spindle has a facing head with "star" feed, and the traversing spindle has hand-feed and screw socket for securing drills, reamers, taps, &c.

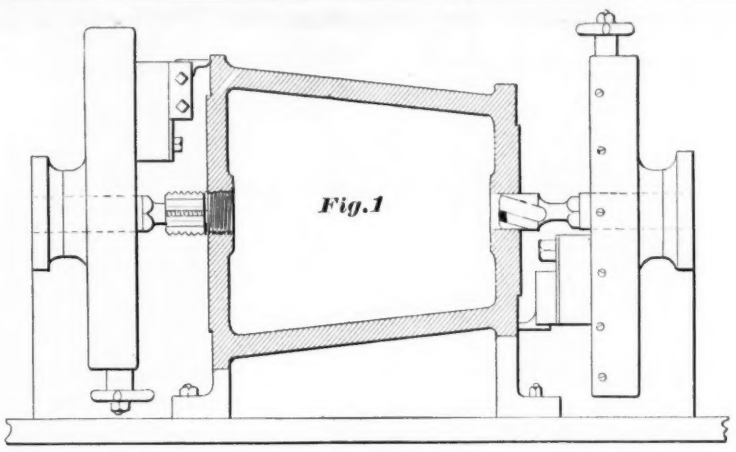
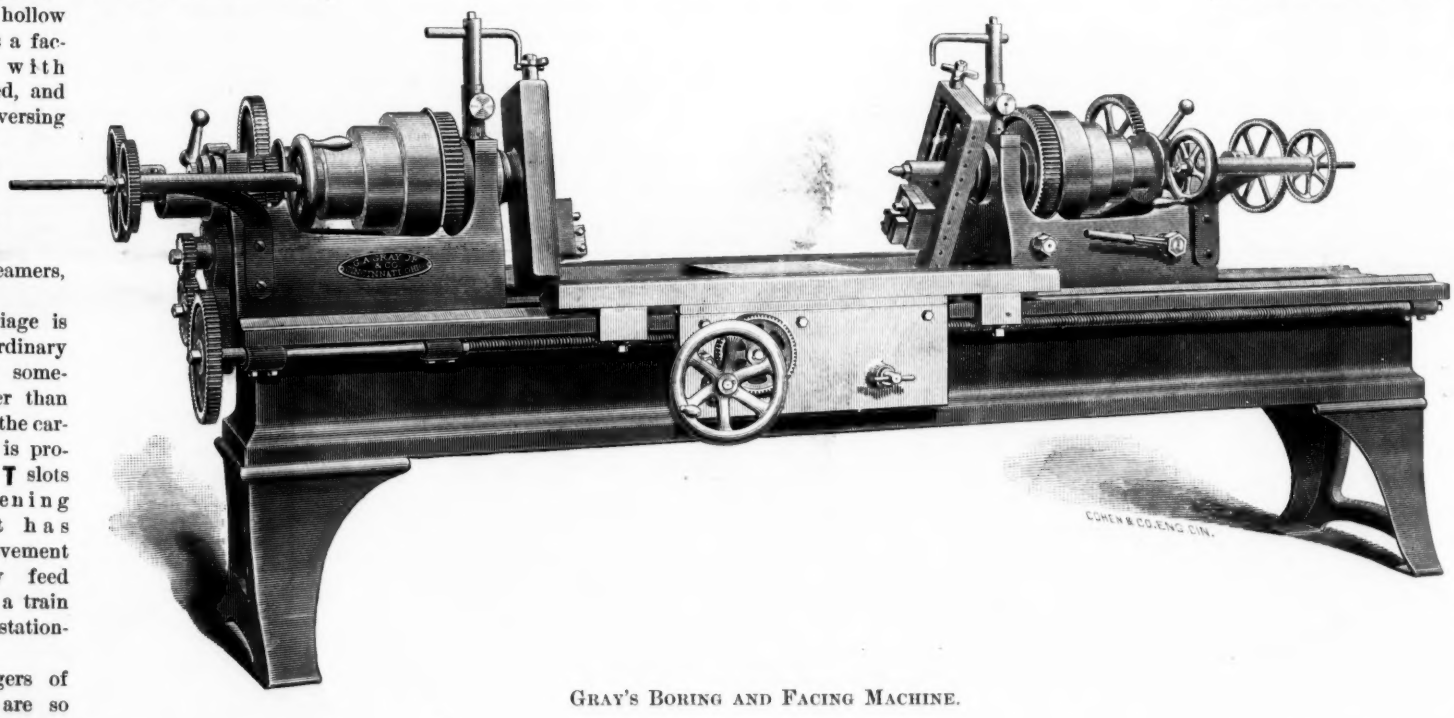


Fig. 1



GRAY'S BORING AND FACING MACHINE.

The carriage is of the ordinary form, but somewhat longer than the usual lathe carriage, and is provided with T slots for fastening work. It has hand movement and screw feed driven by a train of gears at stationary head.

The fingers of star feed are so constructed as to be easily thrown in and out without being thrown out of adjustment, and the tool holders in facing heads have adjusting screws for setting the exact amount of cut.

The carriage may be locked or clamped at any desired position on the bed by tightening screws in gibs.

In boring and facing a steam pump center, or other similar piece, the casting is fastened to the carriage in a special fixture. The carriage is then moved so that the work will come nearly in contact with tool in post-head, the loose head is moved up to the work, and both the carriage and loose head are clamped.

Both ends of the casting may be operated upon at the same time or separately, as occasion requires, the object being, however, to work upon as many places at one time as the nature of the work will permit; this being the main point in the economical performance of work. It is evident also that if the machine is true, and the piece is finished at one setting, the work will be true.

In the detail engravings, Fig. 1 represents boring, tapping, and facing steam pump centers, in which operations the carriage is locked.

Fig. 2 illustrates the manner of boring and facing cylinders and similar pieces, the loose head-stock being used as a tail-stock and the fast head-stock as the driver. The facing is done before or after boring, all the work of course being done at one setting.

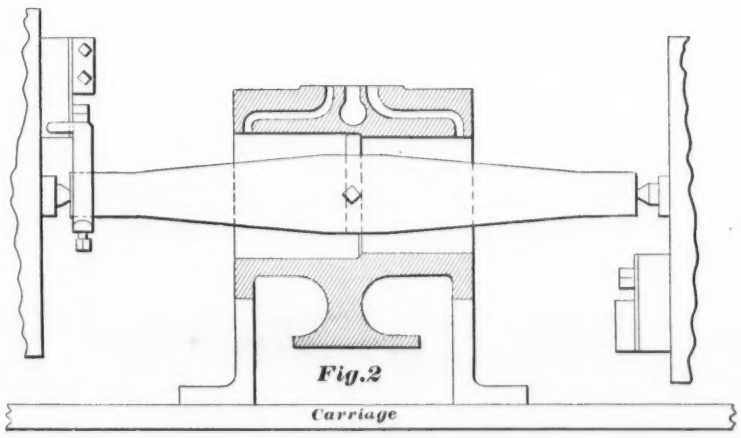


Fig. 2

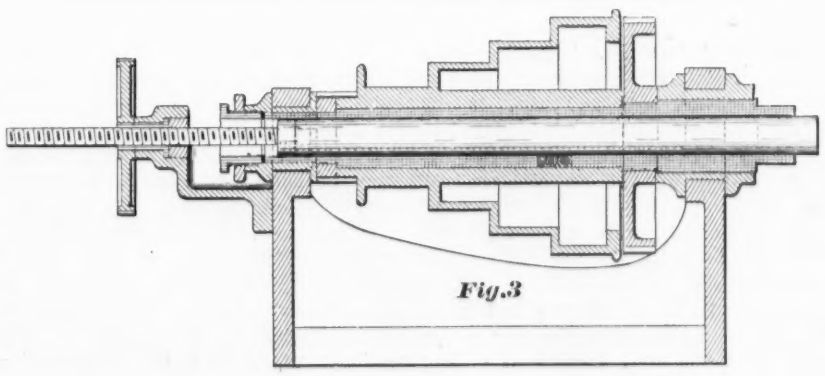


Fig. 3

Fig. 3 shows a longitudinal section of head-stock.

The Milling Machine, Its Construction and Uses.

BY JOHN J. GRANT.

The constantly increasing demand for more light on the subject of milling, or cutting metals with rotary cutters, has led the writer to give vent to his ideas on the subject in the columns of the AMERICAN MACHINIST, feeling that through this source he can reach more of those he wishes to reach, viz.: operative mechanics, than through any other available means.

The milling machine, as a labor-saving tool, in the average machine shop of to-day, is almost unknown. I do not speak from hearsay, but from actual observation, having visited hundreds of shops in the last few years.

That the interest in the subject is growing is shown by the increased demand at all tool-building shops for milling machines, both regular and special. If the writer succeeds in helping in the least to shorten the time of the ultimate substitution of the milling machine for the planer in all machine shops, and for nearly every operation now performed by the planer, he will feel amply repaid. I know my inability to cope with a subject of such importance, but hope at least to start a ball rolling that shall gather in size, and bring out the views of men who have had long practical experience in this kind of work.

The articles will be illustrated from time to time with cuts of the best-known forms of regular and special milling machines; also with cuts of tools and fixtures now in use, as well as new ideas and suggestions that may occur.

A milling machine, properly designed and constructed, with accurately-made cutters, will do from two to fifty times the work of a planer. One instance I call to mind, in regard to the immense reduction in the cost of milling over planing, was a job requiring first-class work. The matter of planing or milling was thoroughly discussed, the writer urging the plan of milling and the superintendent of the shop favoring planing, the latter taking the stand that planing would be the cheapest. After carefully calculating the cost of cutters and fixtures necessary, we concluded to give the best planer hand in the shop a chance to figure on the job. His bot-

tom price for each article, consisting of four pieces, was $5.25. After receiving his figures, we decided to make the milling tools. The first was a lot of twenty-five, which would have cost to plane $131.25. The entire cost of milling, including tools and fixtures, was $125, showing a saving in favor of milling of $6.25, the cost of labor for milling each article being only 60 cents. The two gangs of cutters (roughing and finishing) will probably last to do, at the least calculation, one thousand pieces. The superintendent of that establishment is now thoroughly satisfied of the economy of milling, and every year sees a large increase in the amount of milling done at their works. This jobbing one that required first-class planing, and the work being intricate, of course made a good showing in favor of milling; but we will take, for instance, plain parallel pieces, such as the caps for the headstocks, or the aprons for the carriage of the engine lathe, as commonly constructed. No disciple of the planer can want anything better to show off the good qualities of his pet tool. I maintain, and can prove, that at least two such pieces can be milled for the cost of planing one. When the work is irregular in form, the percentage of gain is immense; as, for example, parts of guns, sewing machines, etc.

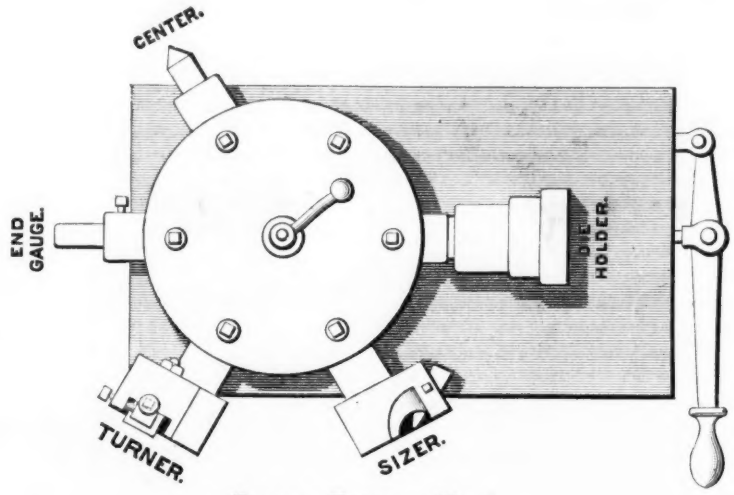
The cost of cutters has been advanced as an argument against the more general use of the milling machine. This is an error, if the time consumed by the tool dresser and the amount of time taken to grind and set the single-pointed planer tool to do the same amount of work is taken into consideration, as, of course, it should be. As a general thing, where there has been a failure to accomplish better results from milling than from planing, the fault will be found in not having a suitable machine for the work, or an illy-constructed cutter. Nearly all toolmakers are apt to make the cutters with too fine teeth; that is, with too many teeth per inch. I have seen a face-milling cutter made from cast iron with inserted teeth, the cutter being twelve inches diameter and having only six teeth, doing excellent work, facing off the ends of cast-iron pieces ten inches wide, doing three times the amount of work that could be done on a planer. The machine was attended by a sixteen-year-old boy. A planer of a capacity for the same work would be over forty inches wide, and, of course, would require a man for attendance. These pieces cost to mill less than one-sixth the cost of planing, leaving out the item of interest on the extra cost of planer. Two milling machines can be purchased for the price of one planer of equally good workmanship and suitable for the same class of work, and the cost for attendance for both milling machines will be less than one-half the cost of attendance for the planer. The so-called universal milling machine has been a regular missionary, and in nine cases out of ten has opened the way wherever used for its more humble kin, the plain milling or slabbing machine.

In the next paper I propose to take up the subject of the plain milling machine, and to show some of the methods of doing work as it ought to be done in every small jobbing shop in the land. I think it can be shown that with such a machine, and a few cutters of the most plain and inexpensive kind, the cost of doing work usually done on the planer may be reduced at least fifty per cent.

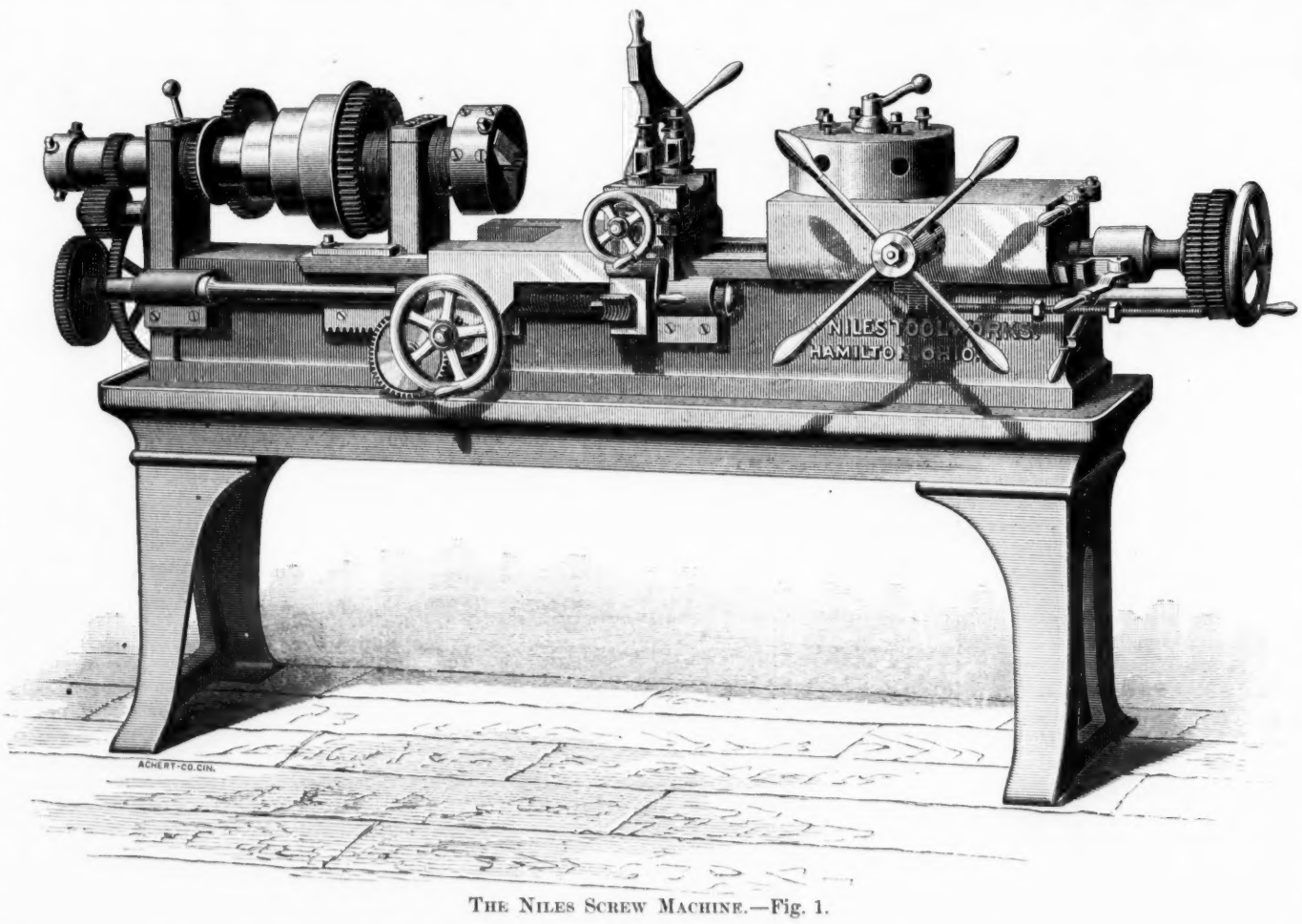
The Niles Screw Machine.

We present with this engravings of the screw machine built by the Niles Tool Works, Hamilton, Ohio, together with details representing the operation of the machine. Fig. 1, is a perspective view of the machine, and Fig. 2 an outline perspective provided with literal references corresponding with the following description, part of which we take from the circular of the company, and which clearly explains the construction and use of the machine:

"*A* is a chuck with hardened steel V shaped jaws. It is fast on the hollow arbor of the machine. *B* is a steadying chuck on the rear end of the arbor. The arbor has a two and one-sixteenth hole through it and its journals are very large and stiff. It is of steel, and runs in gun-metal boxes. The cone pulley and back gear is of the full proportion and power of an eighteen-inch lathe. *C* is an ordinary lathe carriage fitted to slide on the bed, and be operated by hand-wheel *D*, and a rack pinion as usual. Across this carriage slides a tool rest *E*, operated by screw as usual, and having two tool posts, one to the front and one to the rear of the work. This tool rest, instead of sliding directly in the carriage as is the case with lathes, slides on an intermediate slide which fits and slides in the carriage. This intermediate slide is moved in and out, a short distance only, by means of a cam lever *G*. An apron on the front end of this slide carries the lead screw nut *H*. When the cam lever is raised it brings the slide outward about half an inch, and the tool rest *E*, comes out with it and at the same time the nut leaves the lead screw. The inward movement of the slide is always to the same point, thus engaging the lead screw and resetting the tool. In cutting threads with a tool in the front tool post the tool is set by moving the tool rest as usual, and at the end of the cut the cam lever serves to quickly withdraw the tool and lead screw nut so the carriage can be run back. The tool rest is then advanced slightly and the new cut taken. By this means threads are cut without any false motions, and the threads may be cut close up to a shoulder.



Plan of Turret.—Fig. 3.



The Niles Screw Machine.—Fig. 1.

"*I* is the lead screw. This screw does not extend, as is usual, to the head of the machine. It is short and is socketed into a shaft which runs to the head of the machine, and is driven by gearing as usual. The lead screw is thus a plain shaft, with a short, removable, threaded end. The gearing is never changed. Different lead screws are used for different threads, thus permitting threads to be cut without running back. The lead screws are changed in an instant by removing knob *J*. The lead screw nut *H* is a sectional nut, double ended, so that each nut will do for two pitches, by turning it end for end in the apron. *L* is an adjustable stop which determines the position of the carriage in cutting off, facing, etc. *K* is an arm pivoted to the rear of the carriage, and carrying three open dies like a bolt cutter head. *M* is a block sliding on the bed. *N* is a gauge screw attached to this block, and provided with two nuts. The stop-lever shown in the cut turns up to straddle this screw, and the position of the nuts determines how far each way the block may slide. *O* is the turret (shown in plan in Fig. 3), fitted to turn on the block. It has six holes in its rim to receive sundry tools. It can be turned to bring any of these tools into action, and is secured by the lock lever *P*.

"The turret slide is moved quickly by hand by means of the capstan lever *U*, which by an in-and-out motion, also serves to lock the turret at any point. The turret slide is fed, in heavy work, by the crank wheel *R* on its tail screw. This tail screw carries, inside the crank wheel, two gears *S*, which are driven at different speeds by a back shaft behind the machine. These two gears are loose on the tail screw, and a clutch operated by lever *T* locks either one to the screw. Both the carriage and turret are provided with oil-pots not shown in the cuts.

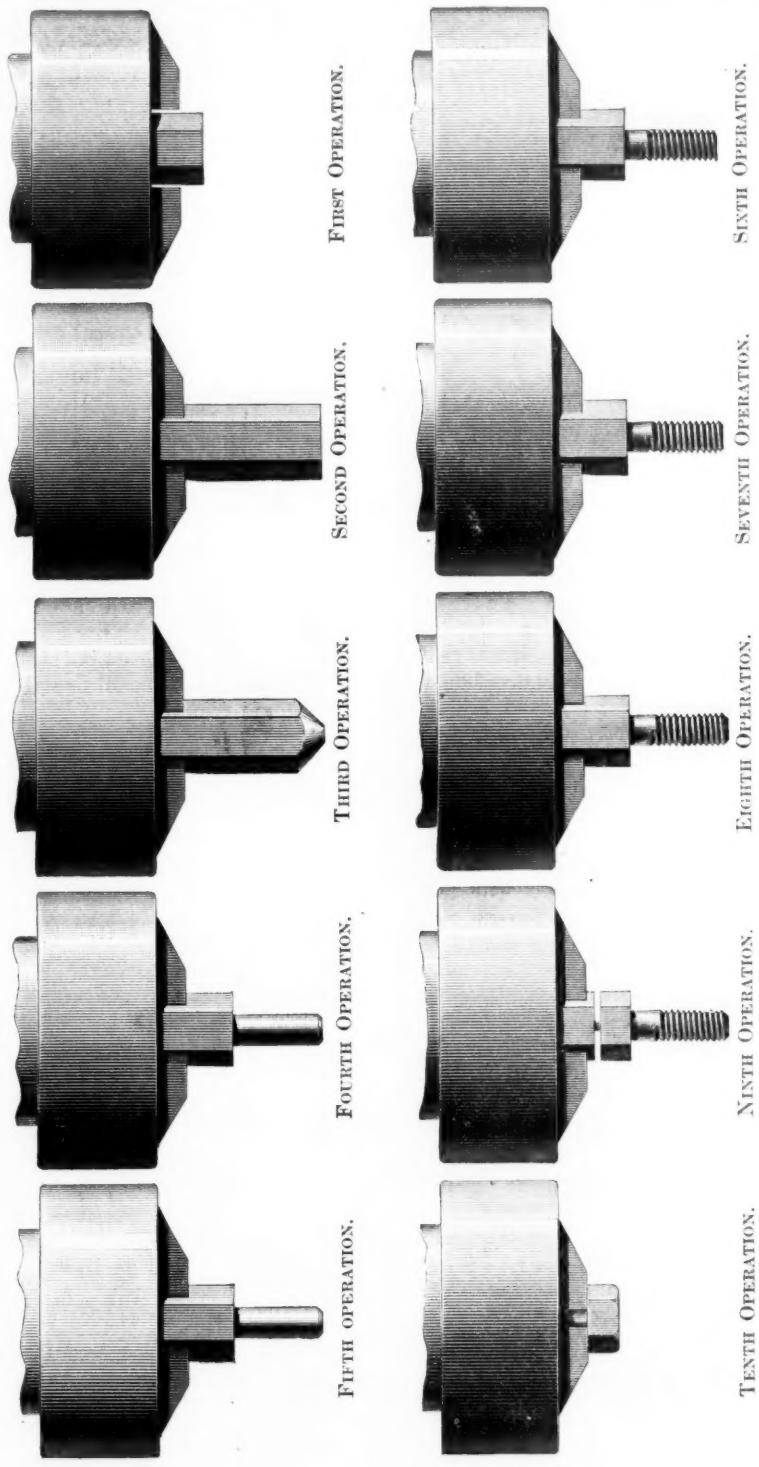
"The carriage has two tool-posts in which are used ordinary lathe tools of various shapes. These two tools are used at different times, and the rear one cuts when the machine is running backward. One may be used as a roughing and shaping tool, and the other used with constantly keen edge to put on the final finish. Or, one may be used to produce a shape on one part of the job and the other used to put a different shape on another part. Generally a cutting-off tool is kept in the rear tool-post.

"In working on steel not well annealed, it is not well to use dies, &c., which under such circumstances quickly lose their size and keenness. The front carriage tool is used as a chasing tool on such work in steel. In using the carriage tools no end measurements need be made on the work, as the carriage stop determines the limit of the carriage travel.

"The open die arm is similar to a bolt cutter head. It is pivoted to the rear of the carriage and is turned forward when in use. It carries a set of open threading dies which can be kept sharp by grinding. The dies are very quickly changed from one size to another. They are recut by a hob which is held in the chuck and turret center."

Cuts on page 3 represent the operations of the machine in making a bolt. In the first operation the bar from which the bolt is to be made is shown inserted through the chuck, and in the second the bar is represented in its position after being set against the end gauge (which determines the length of the bolt), and locked by the chuck. In the third operation, the front carriage bevels the end of the bar so as to assist the turret tool in starting, and in the fourth the bar is reduced at one cut to near the proper size, the length of the part reduced being determined by the arrangement of the turret stop. In the fifth operation, the sizer reduces the body to the exact size, and in the sixth the die arm is

brought down and the bolt threaded, the carriage stop determining the length of the threaded part. The seventh operation is to run the solid die over the bolt, bringing the thread to the exact size, and the eighth is to chamfer off the end thread with the front tool. In the ninth operation, the back carriage tool cuts off the bolt, the left carriage stop determining the length of the head. The tenth operation is to water-finish the head, which is done by a front tool in the carriage after all the bolts in the lot are otherwise finished.



The Elevator Accident.

BY FRANK H. RICHARDS.

I have an impression that of all modern machines not especially designed to kill people the elevator is the most fatal. Though steam boilers outnumber them fifty to one the country through, the casualties they cause are scarcely more numerous. I would call attention to a fatal accident which recently happened in our city (Troy), the circumstances of which were somewhat unusual. A knowledge of the facts may serve as a warning and suggest a possible danger to be avoided, and thus avert an accident in some other case.

The elevator was in a large manufactory, for conveying goods from one floor to another. This is the most deadly kind. Passenger elevators rarely kill people. The precautions that money can command will render an elevator almost absolutely safe. The element of *cheapness* in construction or operation is what makes elevators most costly.

This elevator was out of order, and was being readjusted by a competent and usually careful mechanic. The drum was only long enough to just carry the cable when closely laid, and had but a slight flange at the end to keep the cable from winding over. There was some derangement of the shipping mechanism, and the carriage had been allowed to run clear down, and the drum had run further than that, so that the cable had been slackened and all unwound, and upon rewinding it was allowed to follow its own sweet will, no attention apparently having been given to it. The cable thus did not occupy the first three or four turns of the spiral groove, in which it should have been laid, but cut short across them, leaving an unoccupied space at the first end of the drum. This being the state of affairs, any mechanic could have foreseen the catastrophe. The man at work upon it, most unfortunately, did not notice the danger. The elevator was put in motion, and he proceeded to ride up, standing upon a packing box on the carriage; when near the top the cable, more than filling the drum, ran over and dropped off the end. The first coil being thus suddenly released, the cable was for a moment slackened; then several other coils, like a spiral spring, shot off the drum, and the carriage dropped two or three stories. The man fell from the box upon which he was standing, and was instantly killed, his head being crushed. Some of the lessons of the case are obvious enough. If attention had been given to the rewinding of the drum after the cable had been slackened the accident would not have occurred. If there had been a deep flange or a fixed guard at the end of the drum to keep the cable from running off the accident would not have occurred. How many owning or operating elevators who may read this will see that they are safe upon this point? If the man had not ridden upon the elevator when known to be out of order (he had not completed the adjustment of it) the fatality would not have occurred. When you are "sure you're right" is certainly soon enough to "go ahead" upon an elevator; but when you are only sure that you are not sure be sure to keep off, and you may be sure that is the only sure way to be sure.

There were racks upon the sides of the elevator wall and dogs upon the carriage which, held back by a spring, were expected to catch the carriage in case the cable should break. Had the cable broken close to the carriage they would probably have operated; but in the contingency which actually occurred they proved worthless.

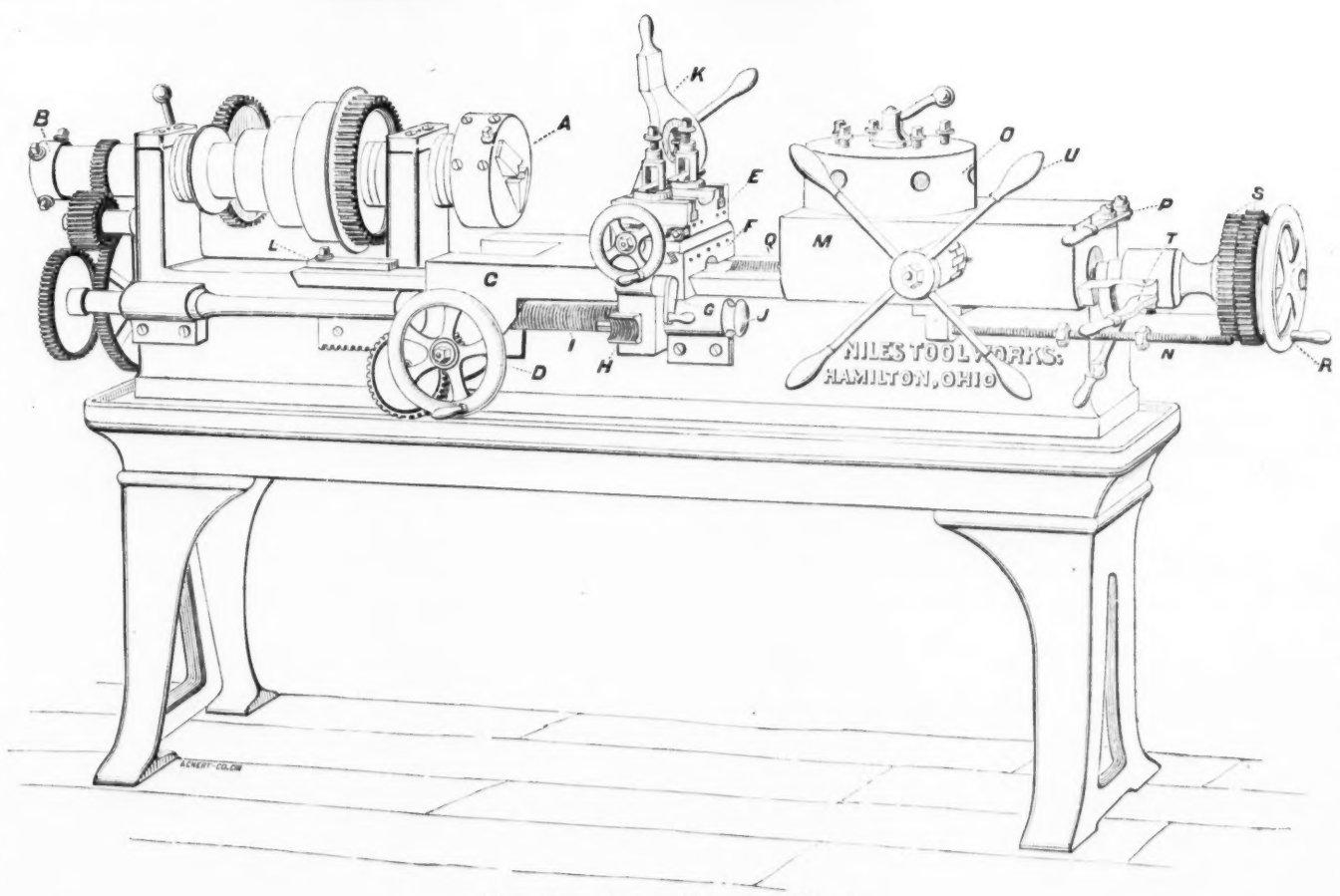
Our elevator system is like some other of our systems: there is no system about it. The cheap freight elevators in our factories, with no one to look after them, with no one who is responsible for them, operated by whoever chance may bring in their way, often a plaything for children, never surely known to be all right, never known to be wrong until some one is killed, and then "nobody to blame," are an institution to be anything but proud of.

The Tolhurst Machine Works, with which the writer is connected, occupies four floors. A commodious elevator makes these floors practically one. All the mechanism of the elevator is in plain sight and as accessible as anything in the building. Every part of it is inspected daily, and there is no rule of the establishment more rigidly enforced than that which reads: "No person allowed to operate this elevator except the man in charge."

The electric railway which was in operation at the Chicago Railway Exposition, and which was described in the AMERICAN MACHINIST of July 21st, has been purchased by a company which has placed it in the Louisville Exposition where it is to be in running until the close of the fair.

Among twenty-five locomotives in the erecting shop of the Baldwin Locomotive Works five have extended smoke boxes and four have Wootten fire boxes. There is nothing novel or unusual in the designs of the engines. The tendency toward heavy machinery continues. A group of narrow-gauge consolidated locomotives have the fire boxes widened at the sides about 6″ beyond the usual line of the frames. All the wheels are placed ahead of the fire-box, and the frames butt on to the front of the fire-box but do not pass farther back. The fire-box is by this plan hung behind the frames and rests upon a sort of saddle attached to the ends of the frames. A heavy bar which passes under the fire-box makes connection between the frames and the deck casting for the purpose of pulling the load.

Grinding metal surfaces as a method of finishing or reducing is every day coming into greater use. Another step in this progress is made by an invention of William B. Fenn, Meriden, Conn. This consists of a grinding and polishing machine arranged so that the work will be automatically passed beneath the grinding and polishing surface, or brought against it at any desired angle. The work is transferred and held by movable carriages which are capable of a wide range of position.



THE NILES SCREW MACHINE.—Fig. 2.

A varnish has been patented in Germany for varnishing patterns, which, it is claimed, (we do not know how justly) dries as soon as put on, gives the patterns a smooth surface, thus insuring an easy slip out of the mould, and which prevents the pattern from warping, shrinking, or swelling, and is quite impervious to moisture. This varnish is prepared in the following manner: 30 lbs. of shellac, 10 lbs. Manila copal, and 10 lbs. of Zanzibar copal are placed in a vessel, which is heated externally by steam, and stirred during four to six hours, after which 150 parts of the finest potato spirit are added, and the whole heated during four hours to 87° C. This liquid is dyed by the addition of orange color, and can then be used for painting the patterns. When used for painting and glazing machinery, it consists of 35 lbs. of shellac, 5 lbs. of Manila copal, 10 lbs. of Zanzibar copal, and 150 lbs. of spirit. —*The Engineer and Iron Trades Advertiser.*

New Ratchet Drill.

In the ratchet drill represented with this, the object has been to produce one with the greatest range of feed for the dimensions, thus providing for more satisfactory working in confined spaces. Some of the novel features of this drill are the long bearing for the working lever *A*, the secondary feeding or adjusting screw *E*, and the spanner wrench, *J*, screwed into the end of the handle.

The advantages claimed for the long bearing are: the lever is less likely to become loose; it supports and strengthens the feed sleeve *B*, and protects the sliding parts from injury. With this arrangement the body is only slightly weakened when the sleeve is fed out to the limit.

The secondary feeding and adjusting screw, *E*, performs two offices, viz., to adjust the drill to the blocking in setting, and to support the feed sleeve *B*.

The spanner, *J*, is arranged to operate the feed without stopping the motion of the lever. When out of use it is screwed into the handle, and the ring at the end is convenient for hanging up the drill.

The drill socket, *D*, is fitted so as to enter freely into the straight hole in the spindle *C*, and is held from turning by a feather. It is easily removed by the hand, or by the screw *E*, for the insertion of another.

These tools are made by O. S. Walker, Carthage, N. Y.

WALKER'S NEW RATCHET DRILL.

Adjustable Bevel.

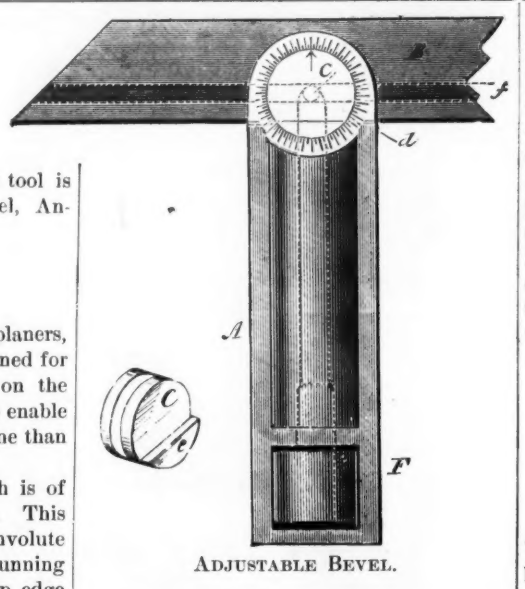
The engraving presented with this illustrates an adjustable bevel, constructed so that the blade may be set at any determined angle by means of suitable graduations.

In the engraving *A* is the stock, which has a vertical slot *a*, within which the blade *B* will play in the usual manner. In one side of the stock is a cylindrical seat *C* for the blade. This cylindrical seat is arranged in a recess so as to extend through the side of the stock, and on its periphery is an annular groove, so that a pin *d*, introduced through that side of the stock, will lie partly in the groove, and thus hold the seat *C* in its place, but yet permit it to rotate; or a screw may be set through the side of the stock, its point entering the groove, and accomplish the same result.

On the back or inside of the seat *C* is a shoulder *e*, and on which the blade rests. The blade, bearing on the shoulder, will, as it is turned to different angles, correspondingly turn the seat *C*.

As a means for clamping, the blade has a longitudinal groove *f*, and vertically through the stock is a rod with a stud *h*, which enters the groove *f* in the blade. This rod extends down to near the lower end of the stock, where it has a nut *F*, the nut being arranged in a recess. Hence, by turning the nut in one direction, the rod will be raised, and in the opposite direction drawn down. When drawn down it clamps the blade upon its seat, and presses the seat downward with so much friction in the recess in which it is placed that the blade is firmly held, and is released by the opposite movement of the nut, so that it may be set to any angle.

The opening in the stock around the seat *C* is graduated, as shown, to indicate the different degrees in the circle, so that the blade may be readily set at any of the angles, a point on the face of the seat *C* serving to indicate the angle. This tool is manufactured by Clemens & Farrel, Ansonia, Conn.



ADJUSTABLE BEVEL.

The Bergen Cam Chuck.

We illustrate with this a chuck for planers, shapers, and milling machines, designed for holding small pieces, usually held on the platen by chisel-edged clamps, and to enable the work to be done in much less time than with the ordinary appliances.

The work is held by a cam which is of tool steel, hardened at its periphery. This cam is in the form of a scroll or involute curve, having a left-hand thread running once around it, thus forming a sharp edge which will bite slightly into the work to be held. The cam is pivoted to a sliding block, which moves freely in the dove-tailed grooves in the plate. The cam may thus be set up against the piece of work, and held by a stop screw so arranged that it lies in the bottom of the slot and may be set at various intervals along it. When the scroll cam is thus held in contact with the work, with its shorter radius toward the same, it only remains to turn the cam with a key provided for the purpose, when the sharp edge both presses against the work and also, on account of its spiral form, presses the work down to the surface of the plate and holds it with great tenacity or grip.

Among other advantages claimed for this tool is, that everything is below the surface of the work, and there are no bolt heads or nuts in the way.

By its use the work may be so quickly set and removed that when many similar pieces are to be surfaced it is practicable to take a roughing cut over all, bringing them to an approximate uniformity, when one setting of the tool or cutter may be made to finish the whole.

THE BERGEN CAM CHUCK.

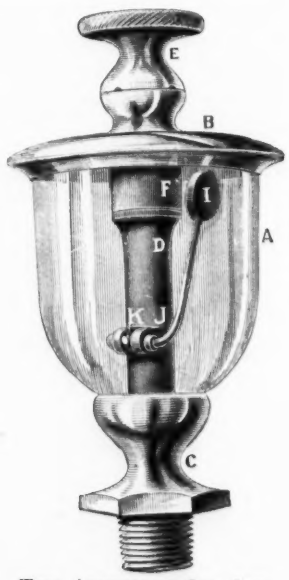
Or, the workman may take a piece off the chuck to caliper or try in place, and need have no apprehension as to whether he can put it back to the same position, as it is just as practicable to do this as to remove a part finished from between the lathe centers.

By bolting to the platen near an ordinary jaw chuck, it will save much raising and lowering of the crosshead, as it will be about on a level with the jaw chuck, so the two may be used alternately, the cam chuck for parallel sides and the jaw chuck for the edges.

This chuck is made by the Bergen Tool Company, Batavia, Ill., and 176 Lake street, Chicago, Ill.

The American Oil Cup.

The accompanying engraving represents an oil cup, especially designed for use on crank-pin, eccentric and cross-head journals of steam engines. The body *A* of the cup is made of glass, the ends being closed by the cap *B* and the coupling link *C* and connecting stem *D*. *F* is a sleeve cast in one piece with *B*, and internally threaded for the stopper. In filling, the oil is poured into the sleeve and escapes into the cup through holes provided for the purpose. A plunger in stem *D* is actuated by the pendulum *I*, and forces the oil on the journal. The pendulum is caused to oscillate by the motion of the part of the engine to which the cup is attached. The motion of the pendulum is controlled in extent by an adjusting screw, which regulates the quantity of oil fed to the journal.



THE AMERICAN OIL CUP.

This cup is made by the American Lubricator Company, Detroit, Mich.

A pathetic wail comes from the British hardware journals that American nails are pushing the English made article out of their colonial market. When the indications first came up that American nails were gaining decided favor in the foreign markets British makers made a drop in prices of their own products which slightly raised the pulse of demand, but it has dropped back again. American nails now form an important item of British trade, and the question agitating the minds of the English makers is, what are we going to do about it?

Locomotive Notes.

BY ANGUS SINCLAIR.

SKILL AND REFLECTION NEEDED IN REPAIRING INJECTORS.

Injectors can be kept in good order with less work than is needed to keep a pump going, but the highest kind of mechanical skill is required for the injector when repairs must be done. Most any kind of machinist can fit a new chamber or plunger into a pump. Many men who will do this job satisfactorily will get badly left when they try to put a defective injector in order. To do such work thoughtful reflection is called for, besides the hand that can do accurate fitting. A workman who may be good on guides, or crossheads, or links, takes an injector apart that will not work, and can perceive nothing wrong with it, because he has not got the philosophy of the thing through his head, and he must have that before he can have insight into the probable cause of derangement.

When an engineer finds that an injector refuses to work, his first resort should be the strainer. That gets choked with cinders or other impurities so frequently that no time should be lost in examining it. One day, when I was running a round-house, an engineer came in breathless with the information that his engine was blocked in the yard, and he must dump his fire, as he could not get his injector to work. The thermometer stood at twenty degrees below zero, and an Iowa blizzard was blowing; so the prospect of a dead engine in the yard meant some distressingly cold labor. I asked the first thing if he had tried the strainer, and his answer was that the strainer was all right, for the injector primed satisfactorily, but broke every time he put on a head of steam. I went out to the engine, and had the engineer try to work the injector. By watching the overflow stream, I easily perceived that the injector was not getting enough water, although it primed. An examination showed that the strainer was full of cinders, and the injector went to work all right when the obstruction to the water was removed.

THE MOST COMMON CAUSES OF DERANGEMENT.

Sand and cinders are the greatest cause of failures with injectors, as they are, indeed, with all water-feeding apparatus. I knew a case where water for a locomotive running on a short plug was taken out of a sandy creek with a siphon. The tank had generally about six inches of sand in the bottom. The engine had a pump and an injector, but all the feeding had to be done by the latter, for the pump never worked a gallon of water. The injector would work that water through when it seemed a quarter sand. In a short time the sand destroyed the tubes of the injector, for it acted on them the same way as a sand blast does in cutting files or glass.

A very common cause of failure of injectors is leakage of steam through throttle valve or check valve, keeping the injector so hot that no vacuum can be formed to make it prime. A great many injector checks have been turned out too light for ordinary service, while others are made in a shape that will always leave the valve away from the seat when they stop working. Then the engineer has to run forward and pound the check with a hammer to keep the steam from blowing back, and that soon ruins the casting. Check valves set in a horizontal position are worthless with water that contains grit.

TAKING CARE OF INJECTORS.

To preserve a good working injector the

engineer should see that all the pipes and joints are kept perfectly tight. It is hard to keep pipes and joints tight when they are subjected to the continual jars a locomotive must stand, but injectors cannot be depended on where there is a possibility of air mixing with the water. Leaky joints or pipes are particularly troublesome to lifting injectors, for air passes in and keeps the steam jet from forming a vacuum. At first the injector will merely be difficult to start, but as the leaks get worse there will be no starting it at all. Then the air mixing with the water is detrimental to the working of all injectors, as its tendency is to decrease the speed of the water. The compact molecules of water form a cohesive body, which the steam can strike upon with telling force to keep it in motion. When the water is mixed with air it lacks the element of compactness, and the steam jet strikes a semi-elastic body which does not receive momentum readily. This mixture of steam and air does not act solidly on the check valve, but makes the water pass in with a bubbling sound, as if the valve was moving up and down, and the stream of water breaks very readily when it is working in this way.

CASES OF TROUBLE WITH AN INJECTOR.

I ran a Sellers' Improved injector on a locomotive about a year and it was an excellent feeding apparatus, but I several times had curious cases of trouble in getting it to work. Once it got drawing air, and I could not find out where the air was coming from, for the pipes seemed all tight. But the air was going through, for I could hear its mutterings, and the water kept breaking, which was an annoyance on the road. A heater pipe was attached to the injector feed pipe, and I afterward found out that the air was getting in at the top joint of this pipe which did not show a leak, being above the water.

Another time I had almost a failure with this injector out in the snow. I was out with a snow-plow opening the road through enormously deep snow-drifts. We had worked on one bank for several days, and we made water by shoveling snow into the tank, which was melted by blowing steam through the heaters and injector. Cinders were passed into the tank very freely with the snow, and presently I began to have trouble with my injector. I took it apart several times and cleaned out cinders, when it went to work all right again. But a time came when it refused to work when there were no cinders inside, and it seemed that no amount of coaxing would make it start. It would prime all right, but so soon as I gave it steam the water would break. Driven to my wit's end, I made the fireman try to work the injector while I went down and watched its action. Everything seemed tight; I had examined the strainer and there appeared no reason why it should not operate as well as it ever did. While watching it, I saw a drop of water oozing out at the stem of the overflow valve, but I reasoned, "that cannot affect the working of the injector because it is ahead of where the water starts." But seeing that the thing would persist in not working, I put a bit of packing in the overflow stem thinking it will do no harm any way, and then the injector went to work all right and I had no more trouble with it. So a defect that may look trifling, sometimes proves serious to an injector.

COMMON DEFECTS.

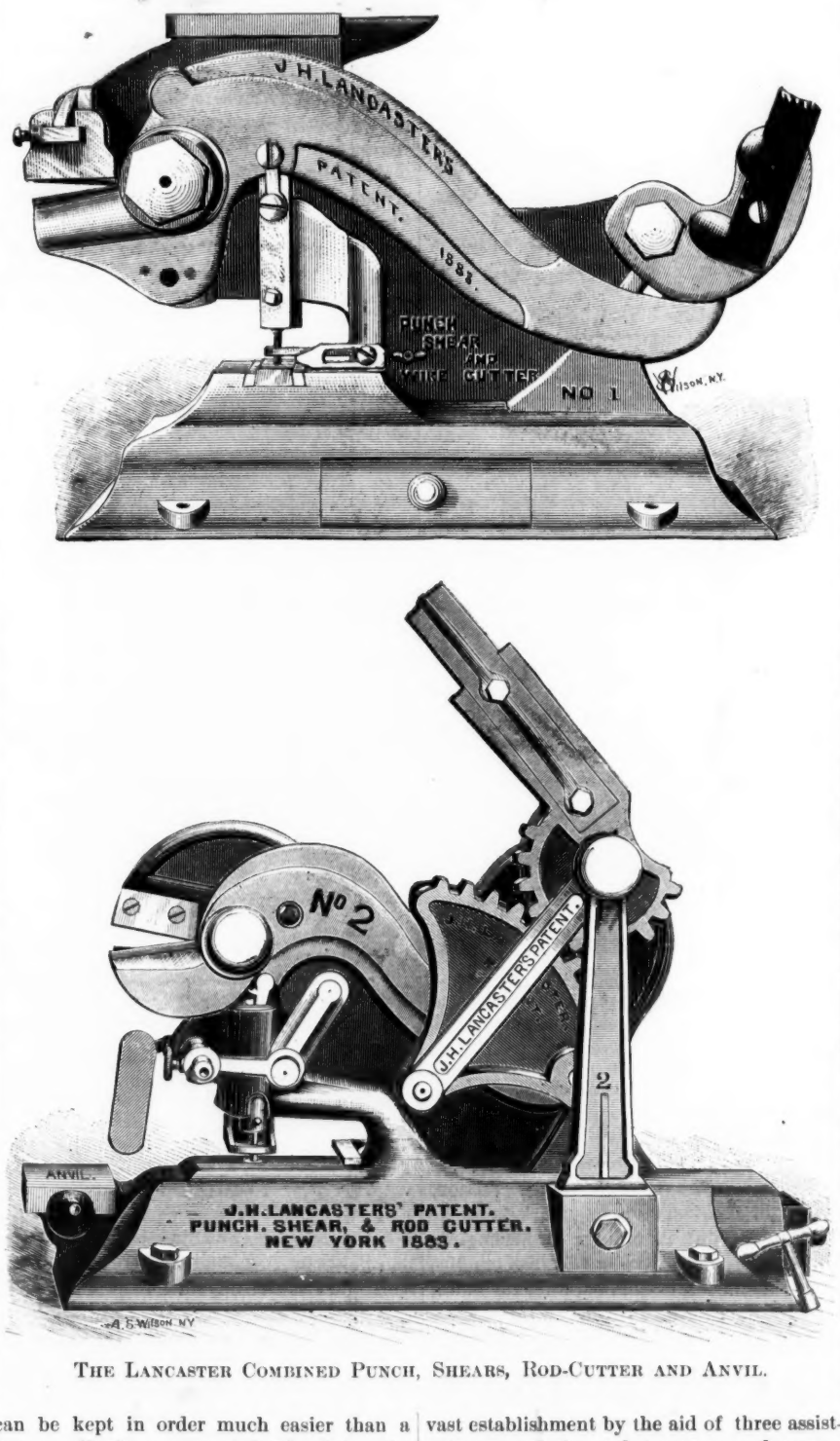
As maintaining unbroken speed on the water put in motion is the first essential in keeping an injector in good working order, anything that has a tendency to reduce that speed will jeopardize its action. A variety of influences combine to reduce the original efficiency of an injector. Those with fixed nozzles are constructed with the orifices of a certain size, and in the proportion to each other which experiment has demonstrated to be best for feeding with the varied steam pressures. When these orifices get worn out of the proper size, the injector will get working badly, and nothing will cure it but new tubes. The tubes sometimes get loose inside the shell of the injector and drop down out of line. The water will then strike against the side of the next tube, or on some point out of the true line, scattering it into spray, which contains no energy to force itself into the boiler. A machinist examining a defective injector should always make sure that the tubes are not loose. Injectors that suffer from this defect will not work without a high pressure of steam. Injectors suffering from incrusted water passages will generally work best with the steam low. Cases of the latter kind are common in calcareous districts. I have known instances where injectors got so incrusted with lime that the passages were almost closed.

Joints about injectors that are kept tight by packing must be closely watched. Many an injector that failed to work satisfactorily has been entirely cured by packing the ram gland.

During severe frosty weather an injector can be kept in order much easier than a pump. During a recent hard winter the railroads in the coldest regions of the country lost many pumps by frost, but damage to an injector was very rare. In one particular case a northwestern railroad lost 25 per cent. of the pumps belonging to its locomotives, and not a single injector was seriously damaged.

To keep an injector clear of danger from frost, it should be fitted up so that all the pipes can be thoroughly drained by frost cocks put in for that purpose. Bends in the pipes where water could stand should be avoided as far as possible, and where they cannot be avoided the lowest point should contain a frost cock.

To run an injector successfully, thoughtful care is requisite on the part of the engineer, and where this is given the injector will prove itself a very economical boiler-feeder.



THE LANCASTER COMBINED PUNCH, SHEARS, ROD-CUTTER AND ANVIL.

System in the Baldwin Locomotive Works.

The operating of the Baldwin Locomotive Works is carried on in a highly-systematic method, under direction of Mr. Edward Longstreth, the superintendent. At present there are about 3,000 men employed about the works, and they turn out about two locomotives each working day. When working on ordinary eight-wheeled engines, they can finish eighteen each week, because in that class of work every man knows just what to do without special directions. Novel designs of engines greatly delay work, owing to the necessity for making patterns and drawings which require men to work out of the daily routine.

Mr. Longstreth carries on the work of this vast establishment by the aid of three assistants, one clerk, and twenty-one foremen. Each foreman is held responsible for the proper performance of his part of the work, and he in his turn is assisted by various gang bosses to carry on the work. While requiring the foremen to attend to the minutiæ of the work, the eye of the superintendent closely watches every detail in order to detect defects in material or finish; and when a flaw is detected, the proper party is held to the responsibility.

The excellent system of gauges in use in this establishment, which are described by Mr. Coleman Sellers, and published in the AMERICAN MACHINIST of July 28, originated principally with Mr. Longstreth, who has risen from apprentice to his present position. Twenty-five years ago he entered the works as apprentice, and from that time he has been closely identified with the progress of the establishment.

Comparatively few changes take place among the staff of workmen, especially among those engaged on skilled labor. The same set of men remain from year to year, many of them having homes of their own about the city. A good evening technical school for the instruction of apprentices and workmen is maintained, the teaching being done by foremen, draughtsmen and others. No young man who desires to obtain insight into the principles of mechanics need remain ignorant, if he possesses the perseverance needed to attend the classes and follow the studies. Elementary branches are taught for the benefit of those who need them. Schools of this kind are now carried on by most of the large locomotive building establishments. Other works might do themselves and their workmen much benefit by following the good example. The youths who take the lead in these evening technical schools are those who will take the lead in mechanical construction a few years hence.

The Lancaster Combined Punch, Shears, Rod-Cutter and Anvil.

The engravings represent two sizes of what would appear to be a very convenient and labor-saving machine, for the use of metal workers and machinists, or for any use where moderately light metal is to be cut or punched, or rods or wire cut up. The arrangement of the toggle-joint lever and gears provides for getting unusual power with a short lever, making the operations easily performed, while the compact character of the machines permits them to be located on a bench or in any other convenient position, and without requiring more than a nominal space for their location. Although a short lever is used we are informed that a pressure of about 40 lbs. is sufficient to punch a $\frac{1}{4}''$ hole through $\frac{1}{4}''$ iron.

The anvil is convenient for use, and a drawer for holding the punches, dies, wrench, &c., prevents their loss. The parts are made interchangeable, and dies and punches for special and irregular work can be readily fitted and used. On both sides conveniently arranged adjustable gauges provide for the rapid duplication of pieces, so that in any of the operations no time is lost in marking out work and working to lines.

The No. 1 machine weighs 21 lbs., has a base $6''$x$11''$, is 10 inches high, and has a lever $12''$ long. This size will punch holes $\frac{1}{16}''$x$\frac{1}{16}''$, shear $\frac{1}{8}''$x$1\frac{1}{2}''$, and cutwire up to $\frac{1}{4}''$.

The No. 2 machine weighs 90 lbs., has a base $9''$x$20''$ is $14''$ high, and has a lever $34''$ long. It will punch holes $\frac{1}{4}''$x$\frac{1}{4}''$, shear $\frac{1}{4}''$x$2\frac{1}{4}''$ and cut $\frac{1}{4}''$ rods.

In operating the Bound Brook line, it has been customary for the Central of New Jersey and the Philadelphia and Reading Railroads to use their own locomotives, making the change at Bound Brook. Since the Philadelphia and Reading has got possession of the whole line now, arrangements are being made to run the locomotives from Jersey City to Philadelphia. As the ordinary locomotive water tank will not hold sufficient water to run ninety miles, and as it is considered too much delay to stop for water, the company is constructing large water tanks that will carry the necessary supply for the whole run. This company objects to the practice of lifting water from a trough while the train is running, considering the plan troublesome and expensive.

The Pennsylvania Railroad Company encourage their engineers and firemen in the practice of economy in the use of coal, by paying them premiums for savings. A certain quantity of coal is allowed for each engine per car mile, and the value of any part saved is divided equally between engineer, fireman, and the company. They also pay a premium to the engineers who come in on time with the greatest regularity during each three months. The engineers who received the premiums for making time on the Jersey City division, for the last three months, were George Ginglen, engine 956; Charles Metz, engine 1034; and J. Vanardsdale, engine 184.

LETTERS FROM PRACTICAL MEN.

Spring of Planer Drop Blocks.

Editor American Machinist:

From time to time your correspondents have been discussing the cause of the spring of planers on side cuts. Now a planer may spring in the posts when being handled by engineers and scientists, but with a common journeyman, a fruitful source of spring is the drop block. As yet, I have not seen any device for taking up the wear. Allow me to submit two ideas that may do away with the trouble. In figure 1 the block is beveled from the hole *B* to the bottom, with the widest side out, and the back planed off as shown at *c*. It is only necessary to plane it off at *D* to make it tight.

In figure 2 the wear is taken up by the gib; the bevel at *d* will bind the end to the swivel; the bottom end is kept in place by beveling the head of the screw *B* inward as at *D*, with a place to fit it on the end of the gib. By setting the swivel as at *c*, the block will not have a tendency to lift it out, or pull it out. The adjustment is made by filing off at the end at *d*.

I submit both of these plans for the benefit of your readers. They have their faults, which I would rather your correspondents would point out. F. C. D.

Steel Hardening—Pliable Condition of Hardened Steel—Different Methods of Cooling.

Editor American Machinist:

The discussion which is going on in your paper in regard to working steel, tool dressing, etc., is interesting, and as there is no subject of more importance to the machinist than this, I sincerely hope that you will make every effort to get all the information possible before letting the matter drop.

Will Mr. Goodyear tell us what he knows about the pliable condition of hardened steel? In my practice I find that hardened steel, at a temperature somewhat above that of boiling water, may be bent, but that should the temperature be raised too high this pliable property will disappear. From my experience, and from what others have told me, I am led to believe that there is a condition of hardened steel about which very little is known. During the past few years I have corrected the errors, due to hardening, in many thousands of pieces of steel, simply by putting them under pressure and then drawing the temper. If, however, the temper be drawn so as to show color, before the pressure is put on, the steel will not have its shape permanently affected.

I most heartily endorse what Mr. Goodyear says in regard to making a tool for cutting hard steel. If a tool be carefully heated and then well hammered and hardened as described, it will be much more satisfactory than such a tool as the one described by your correspondent, J. H. Gartside. As to the edge crumbling, that is the result of Mr. Gartside's reckless method.

If steel be heated to a sufficiently high temperature, and then rapidly cooled, it makes little difference by what means the cooling is effected. A thin saw or circular cutter, for instance, may be hardened as surely between two plates of cold metal as by the best liquid ever used for the purpose, with the advantage, also, of coming out straight.

There is, undoubtedly, a critical temperature at which steel should be cooled to get the best results. I regard it as of the utmost importance to know what this temperature is for the various grades. A dozen pieces may be cut from the same bar, and all hardened at what appears to be the same temperature, and yet, because of a slight variation of heat, they will vary greatly as to durability.

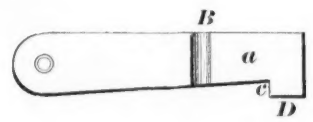
I would suggest, for the benefit of those who may not know, that almost any tool may be prevented from cracking during the hardening process by cooling first in water and then in oil, being careful to keep the article long enough in the water for it to become hard before dipping it in the oil. I believe that any liquid or method which will cool steel with sufficient rapidity is good for the purpose. T. R. Almond.

Brooklyn, N. Y.

"Instructing Master Mechanics."

Editor American Machinist:

I was exceedingly gratified upon reading Master Mechanic's criticism of F. W. Dean's remarkable paper. I am a lover of the American locomotive, but if slab frames, iron cabs, such as are used in England, (why not call them dash-boards and have done with them) domes and sand-boxes without mouldings, and boilers without domes are likely to be adopted, I think the move will be in the wrong direction, and I am likely to change my views in regard to the value of our locomotive. Just what effect that will have I cannot say, but the probabilities are that the production of locomotives will not be impeded to any great extent. Hydraulic motors may be useful in certain places, but I have never heard of a successful one drawing a train of cars, although on an Eastern road, I believe they



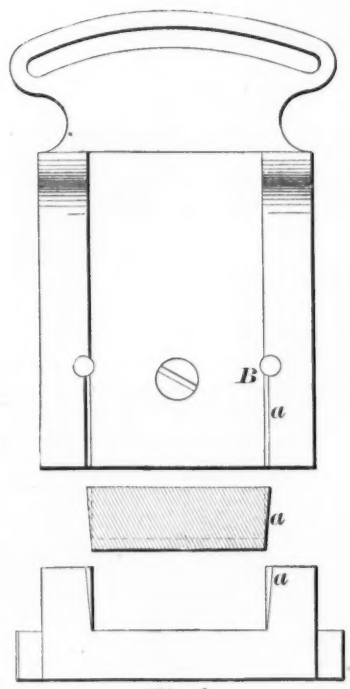


Fig. 1

have some of them in the shape of locomotives without domes. In conversing with engineers who have run them, I have learned that dry steam is unknown.

I congratulate M. M. on the stand he has taken in regard to that marvel of perfection, the American locomotive, and I hope he will always put mouldings on his engines and not copy anything from English practice merely because it is English, as some builders seem to be doing at present.

Engineer.

Shop Drawings.

Editor American Machinist:

Much has appeared from time to time in your columns in regard to mechanical drawing, and it is interesting as well as instructive to learn the views of men engaged in various branches of work, and in different sections of the country. Without disparaging others, I will say that the ideas and information contained in the articles by Prof. Sweet, are of great value, and it is to be hoped he will continue to favor your readers with his views on this and other subjects.

A fault quite often met with in machine drawings, and one which causes vexation and delay in the execution of work, is the careless manner of placing the dimension figures. There are always certain principal lines, or points from which the dimensions should be given, in order to avoid confusion and errors in the shop. The civil engineer, in leveling, establishes a base line, or *datum*, to which all measurements are referred, and takes special care to avoid confusion and complication of figures. The same idea should be carried out in mechanical drawings, to a certain extent.

It is of much more importance that the dimensions should be given in a clear and connected manner, than it is to have the various parts carefully shaded, and shadow lines drawn in the proper place, in strict conformity with technical rules. In fact I have yet to find a workman who appreciates the latter to any considerable extent, while it is almost a daily occurrence, in many shops, to hear remarks not altogether complimentary to the draughtsman, caused by the dimensions being given from a point which has no definite connection with the principal parts of the work. Too often the figures and construction lines are hurried over as if they were of secondary importance, when, in fact, they are of the very first importance; at the same time, hours may be spent on a fine heading, which is of no use whatever, so far as the construction of the work is concerned.

Every line and figure that is not necessary detracts from the usefulness of the drawing. The majority of workmen, although they may be accustomed to working from drawings, will not so readily understand them as one who is engaged in making them, and a

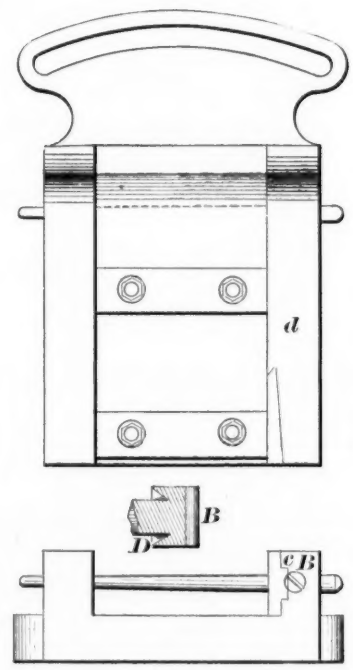


Fig. 2

multiplicity of lines and figures has a tendency to confuse them and lead to errors.

Gordon.

A Compound Tramway Motor for Australia.

A tramway motor has just been finished by the Baldwin Locomotive Works for the Australian Government, which possesses several novel and interesting features. The motor is intended for service on the tramways in and around Sydney which are operated by the Government of the colony, and it was designed by George Downe, Superintendent of Machinery, who was sent from Australia to look after the building of the machine.

Friday morning (August 3) the motor was steamed up ready for the road. A party of gentlemen who had been invited to witness the trial-trip were in attendance, and among them was a representative of the American Machinist.

A run was made over part of a division of the Philadelphia and Reading Railroad, and the motor performed its work in a satisfactory manner.

The engine and boiler of the motor are enclosed in the end of a car which is 38 feet long, and weighs complete 14½ tons. The boiler is vertical, and is adapted to burn any kind of coal or coke, the latter being the material used on the trial-trip. The engine is of the compound type, with two cylinders at each side standing vertically inverted above the driving shaft. They are connected in the tandem fashion, the high-pressure cylinder being on the top. It exhausts round the casing into the low-pressure cylinder. Piston-shaped valves distribute the steam and they are actuated by the Joy valve-gear. By moving a supplementary valve the steam is led directly to the low-pressure cylinders, which enables the engineer at will to increase the power to a remarkable extent. This arrangement is specially made for the work the motor is intended to perform.

The street grades in some parts of Sydney are intensely heavy, as high as 270 feet to the mile being ascended. When the motor is running along on ordinary grade, the expansion of the compound cylinders will be utilized, but when a steep grade is reached the increased power of steam acting directly in the four cylinders will enable the car to ascend without difficulty. Besides a good means of using the steam economically, it is expected that this compound engine will supply ready and convenient reserve power.

The engine and boiler rest on a bed plate and are fastened so that they can be readily moved out and another engine or boiler put in the same place. By this means of interchangeability it is expected that the use of the engine or the car may be preserved in cases of accident. An engine or boiler can be taken out for repairs and the car kept running.

The Joy valve-gear was adopted because it obviated the use of eccentrics which are objectionable in the sandy region of South Australia. The boiler is fed by a Korting injector and the car is equipped with Eames' vacuum brake.

Should this motor prove as successful as the designer expects, the whole equipment will be worked into this pattern. There are already about forty motors in Sydney of the Baldwin make, and Mr. Downe speaks very highly of their durability and convenience. Sand circulates around there so badly that a set of rod brasses gets worn out in six weeks, so the service is of a nature that tests in a thorough manner the utility of rival machines. Subjected to this searching ordeal American motors have forced their way into public favor in the British colonies. This is a clear case of survival of the fittest and reflects great credit on American work and material.

A Neat Machine Shop.

Away out near the end of Walnut street, Philadelphia, amid handsome residences and clean streets stands a four-story oblong brick building which appears in perfect accord with its surroundings. There is not a rejected casting or the remains of a venerable shaft lying around the outside of the building, not a broken cog or stray bolt to be seen, yet this is a live machine shop, with all the complete adjuncts of foundry and blacksmith's shop within the enclosure. It is the new shop of Schleicher, Schumm & Co., makers of the Otto gas engine.

A feature which strikes the visitor accustomed to the ordinary run of American shops is the great extent to which iron has been applied in building them. The floors are supported by beams of double flange iron, the beams in many instances being used for traveling-crane roadways. The center of the floors is supported by rows of cast-iron pillars—one being placed immediately above that which is beneath, so that they form a solid column to the top of the building. The shafting brackets are all bolted to shoulders cast on the upright pillars, so that a sagging of a floor does not interfere with the alignment of the shafting.

In the lower story of the building traveling-cranes traverse the whole length, and all work handled about the machines is moved by the cranes. Wherever a tool is placed that usually works on material that one man cannot handle, a power appliance is provided for doing the lifting. Chinese windlasses are placed over many of the machines, and by their aid one man can adjust and move round work that would make heavy lifting for three or four men. By this means unskilled labor is dispensed with. Only four laborers are employed in a force of 140 men.

Milling machines do a great deal of light work here, and they would have even more extended use were it not for the difficulty in making and keeping of the cutters. There is a curiosity in the way of an automatic bevel-gear cutting machine which performs that difficult operation accurately under the manipulation of a boy. This machine was made by Brehmer Brothers, of Philadelphia, who are preparing to put it on the market. Several other special machines well worthy of examination are to be seen in Schleicher, Schumm & Co.'s establishment.

The blacksmith shop is well worthy of inspection, and is a model of neatness, a somewhat unusual attribute with the house of the forge and anvil. The windows are filled with movable wooden slats which admit light and air, and do not get broken up by every chip and flying bolt-head.

Outside of the main building an elevator works in an iron frame. All material and tools are transferred to the various floors by this outside elevator. Here there is no chance for monkey-wrenches, lathe chucks or apprentices to tumble down through hatchways.

We noticed several Otto gas engines at work in the building. Most of the machinists employed by the firm are in the habit of applying the indicator to the engines and they are encouraged to acquire skill at this operation.

Extracts from Chordal's Letters.

THE YORKTOWN SYSTEM OF SHOP SYMBOLS—A MANUAL OF MANUFACTURING DETAILS WANTED—A FAIR TEST OF A MECHANIC'S INTELLIGENCE.

Mr. Editor:

* * * In a late letter, devoted exclusively, as near as I can remember, to time-keeping questions, I referred you to a system of symbols used in the Yorktown engine works. This system, as explained, does not vary materially from that used in many, and I may even say most, of the larger shops in the country. I gave it simply as illustrating a principle, and I think it well to go further into this question of symbolism, still confining myself to the Yorktown system.

* * * The system, as far as referred to in my former letter, consisted of a letter symbol to define the class to which the machine belongs; a number to indicate a special design in that class; a following number to indicate a particular piece of the machine, and a lot number to indicate its date of construction. These symbols were marked upon the drawings, and upon the patterns and were carried through the time and cost account.

Taking the case cited in the former letter, the symbol "D16, Lot. 7, No. 32" is translated as follows: The "D" means portable engines on skids; "16" means the 16th style of such engines got out in the shop; "Lot 7" means that this is the 7th lot put into construction; "No. 32" means the crosshead The figures 32 do not necessarily mean a crosshead simply because it is 32, but it does mean a crosshead on this engine because on the drawings for this engine the crosshead bore that number; each piece of the engine being understood to bear an individual number.

* * * Personally I am not an admirer of the Yorktown system of symbolism, but having explained a portion of it, it would be improper not to complete the explanation. The only thing to be added is that this number 32, which indicates the number of the piece, is subject to a slight symbolic variation according to the material of which that piece is to be made.

* * * A plain number, as No. 32, always indicates that the piece is to be made of cast iron; if the number is preceded by a cipher, as "032," pronounced "ought thirty-two," it indicates that the piece is of wrought metal, either iron or steel, as further explained by the drawings. If preceded by two ciphers, "0032," pronounced "double ought thirty-two," it means that the piece is brass. If preceded by three ciphers it means that the piece is of wood, and if preceded by four ciphers it means that the piece is of some material other than those previously mentioned, such as leather, rawhide, lead, platinum, rubber, or anything rarely used.

If the crosshead of D16 bore the number "032" it would show that that crosshead was to be made of wrought metal; while if it bore the number "000032" it would show that it was to be of leather or beeswax, or something else, whatever the drawing called for.

It will be seen that in one sense the symbol tells what the piece is to be made of, while in another sense it fails to tell. Thus in the case of forgings; a piece bearing the number 017 is required of wrought metal, but we don't know whether it is to be of wrought iron or of steel, or boiled iron, refined iron, Sligo iron, or of cast steel, or machinery steel, or mild steel, or what not. The symbol is merely intended to show where the piece, or the material of the piece, may be expected from. Being wrought metal it falls under the head of forgings, and naturally goes on blacksmith shop requisitions, and goes to blacksmith shop acounts. The drawing from which the blacksmith shop works will show the material of which this wrought metal piece is to be made.

When we get up into the comprehensive four ciphers the case is somewhat different—we might almost say it is a break in the system. The symbol not only fails to tell of what the piece is to be made, but it fails even to point out in a general way the class of material of which it is to be made. It simply indicates that a piece is not to be made of certain materials, and calls for special inquiry. Of course, a system with a hole in it is no system at all; but so far as I know, and I have had experience with the Yorktown system, this peculiarity of the arrangement has never been productive of trouble, or called for peculiar proceedings. By that I mean proceedings not fully contemplated in the scheme and fully provided for.

* * * In the construction of a complete machine there are, of course, many details which are purchased complete in the market. In steam-engine work I might mention governors, stop valves, check valves, gauge cocks, steam gauges, &c. Each of these pieces appear upon the drawings by some sort of pictorial illustration and specification, so as to constitute a full basis for the order.

Once in a while it is hard to say just what the material of one of these complete details is. A glass water-gauge, for instance, has a glass tube, brass ends, nickle-plate rods, and wooden hand-wheels. Question: What is the glass water-gauge made of, and how many ciphers shall the draughtsman put upon the number? The Yorktown rule is simply to determine upon the characteristic material of the piece. In this piece it would be brass, and the number would be 007, or 0044, or double ought something. A steam gauge in a brass case, whether that case be rough or polished, or plated with silver, would be called a brass gauge; with an iron case, it would be an iron gauge. Two nickle-plated gauges identical in appearance, one plated on cast iron and the other plated on brass, would therefore have differing numbers—one a plain number, as No. 75, cast iron, the other a brass number, as 0075.

* * * I will here mention that a certain shop I know of varies the Yorktown system of symbols as follows: a symbol one ought (0) for castings—foundry account; two oughts (00) for wrought metal—blacksmith shop account; three oughts (000)—purchase supply account. I have had no personal experience with these variations, but am told that it is all right, and I see no reason why it should not be, because, aside from the three sources of supply mentioned, the Yorktown system is of no special value.

* * * I wish it were possible for me to take up the Yorktown method in its entirety, as it is one good example of a thorough method, and explain it fully from the raw studies of the new machine to the trial drawings; to the first machine constructed; the perfect working drawings for the shop; the retained copy for safe-keeping and reference; alterations in the drawings; pattern storage; the patterns and the pattern identifications; special flasks for the machine; general cost account; orders of construction; progress of the work; completion; inspection; acceptance; packing and boxing; shipment and history of sales in that particular line, together with the reports from customers as far as received.

I don't pretend to know all, or even much of this general subject, but I know something about it, and I don't remember to have ever seen anything in print relative to the matter, and I know from earnest inquiry by American and European correspondents that information on the subject is much desired. One trouble in attempting to treat such an extended subject in these letters results from the frequent breaks necessary. "To be continued in our next" is a rather discouraging sentence, and I question very much whether my own circumlocutory powers could be turned into a briefing channel with any good results.

* * * While the proper unfolding of such systems involves naturally concise descriptions, the systems are simple when finally understood. If one of our manufacturers of a literary turn, and a pride in what he knows, would compile a manual setting forth the methods and details of a thoroughly comprehensive manufacturing system, illustrating it with printed forms, indicating the staff required and the special duties of its members, I believe he would be doing this world considerable good.

The term "comprehensive system," of course means a great deal. But I don't mean a system applicable alike to cotton factory and woolen mill, and iron works and acid works; but I do mean a system applicable to metal manufacturers, whether stoves, small-arms, iron steamships or dropped shot, soda water apparatus or mowing machines.

* * * In saying there is no literature on this subject, I may be misunderstood. Upon that detail in the system which refers to cost accounts, I should not neglect to mention a pamphlet by Captain Metcalf, of the Frankford Arsenal, Philadelphia. This arsenal is a manufactory of fixed ammunition, and Captain Metcalf's requirements were peculiarly detailed, as illustrated by the fact that a common musket cartridge involves in its different materials, and in the operations performed upon those materials, perhaps a hundred individual items of record, each of which has to present its cost separately and accurately. The system devised by Captain Metcalf seems to fulfil every requirement in this particular, and the forms and procedures are simple and comparatively certain. The pamphlet referred to, instead of being illustrated by copies of printed forms, has attached to it a full line of the genuine blanks as used.

While I know of no line of private manufacture which requires cost to be carried to such a minute detail as is done in this cartridge factory, there is a general principle involved, and a novel one, I think, which is applicable in a way to any system, and one well worthy the study of those interested. As before mentioned, however, this pamphlet is confined exclusively to the subject of cost keeping, and I don't think it carries that subject as far as a cost ledger. I would suppose that the pamphlet was intended to elucidate the novelties introduced into cost keeping, rather than to be a treatise upon the general subject.

* * * I lately saw a gentleman criticising a new lathe because the tail-stock was held down by a cam and lever instead of by a couple of bolts and a big ring. It was a matter that did not concern me in any way, but I have a quarrel with everyone who fails to appreciate the perfection and beauty of this cam and lever arrangement. Properly made, as it is by all good makers, it will hold a tail-stock every time and under all circumstances. I believe every fault ever found with the arrangement was purely an imaginary one. It seems an insult to say it, but some lathesmen do not understand them; but I think that in the matter of lathes to be used in machine shops, in a trade supposed to be peculiarly refined, it is about time mechanism be made to stand upon its merits and skill be brought into decent conformity with it.

These cams are eccentrics, arranged to be given a quarter turn by the lever; there is a stop for the lever so it cannot push down any further. When the lever is against the stop the swell of the eccentric is up; when the lever is up the swell of the eccentric is at the side. When you commence to push the lever down the clamp is pulled upward with a rapid but powerless motion, gradually changing into a slow but powerful motion. Just as the lever reaches the stop the motion is near zero and the power near infinity. A screw, especially a big screw with a coarse-thread, won't compare with this thing in gripping power. There is a nut underneath the clamp by which the length of the bolt may be adjusted. This nut must be so adjusted that when the lever is down against the stop the clamp is tightly drawn. Force must be required to bring the lever to the stop, and the lever must always go as far as the stop. If the nut is screwed up too far the lever will not go down far enough, and the swell of the eccentric will not go up far enough, in which case the thing won't clamp worth a cent. The lever is just as apt to fly back as not. Is this the fault of the contrivance or of the brilliant mind that turns the adjusting nut?

* * * How it does delight some lathesmen to come down on the wrench of a tail-stock! There is not a particle of use in it for ordinary size lathes; for a man who understands things will run year after year on ordinary work and never tighten but one of the bolts, and the tail-stock will never slip. Another man will take the same lathe, and if it ain't well ballasted he is liable to pull the thing right over as he strains himself on the tail-stock wrench.

* * * I have often thought that unnecessary screwing of certain bolts is a fair test of a mechanic's intelligence. I once got up the drawings for a planer to plane 5 or 6 feet square and 25 or 30 feet long. As a tool-holding arrangement I put in the usual two clamps with four good big screws. The man who ran this planer broke a bolt a week. We made new ones of every kind of iron and every kind of steel, but still they broke. A planer right alongside of this one, doing exactly the same kind of work, using the same tools, taking the same cuts on the same pieces, but run by another man, never broke a tool bolt, notwithstanding there were only two of them and they were very much smaller. After the men were changed awhile, the bolts began to break on the old planer and none broke on the new one. The trouble was, this fellow ate too much beef. He never knew when to quit fooling with the wrench. These are the men who break tool-post wrenches on lathes. They break any kind of an open-ended wrench you give them. A monkey-wrench volatilizes in their hands; they strip bolts and nuts, and spring face plates and angle plates and planer tables and burst pipe fittings and come down on the caps of journal boxes. If anything with a screw to it can be damaged they will damage it. If it is so strong they cannot damage it themselves they will screw it up so infernally tight that somebody will have to damage it to unscrew it. They will go home and screw the lid on the pepper box, and then grumble at the bruising of the bright work when the woman has to use a fork to unscrew it.

* * * Very respectfully, CHORDAL.

A most effective special tool in the Baldwin Locomotive Works is that for punching the rivet holes in tank sheets. The long sheet is fastened on a traveling trolley, which is moved under the punch by gearing. At each stroke of the punch the sheet moves the proper distance for the next hole, and it goes along automatically till every hole in the row is punched. The sheet is then moved so that another row comes in line with the punch, and the work proceeds of its own accord. As the distance between the holes is regulated by an unvarying train of wheel-teeth, each sheet is an exact counterpart of the other and the holes come together with exactness ready for riveting.

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☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those especially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.*

NEW YORK, AUGUST 25, 1883.

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Coaxing Invention.

The notion that invention is a hot-house plant that can be put under glass and forced or coaxed into an artificial development by the offer of money prizes or special rewards is one that cannot too soon be exploded.

Mechanical, scientific and literary results have alike been sought after in this fashion, but usually, we might say, always, to no effect.

The great rewards that were offered by French scientific societies for a cheap process of producing aniline dyes form a case in point. The desired end was in due time quietly reached in the natural course of scientific investigation. It was not in any manner or degree hastened by the hysterical effort of the academicians to coax invention. The present efforts of the French to discover by similar means a practicable method of destroying the insect *phylloxera*, which for years past has been ravaging the vines of their country, have proven equally abortive. When the discovery comes it will doubtless owe its origin to the fact that practical minds realize the need of and chance for profit in such a discovery quite as forcibly as the learned societies.

Recently it was proposed in one of the sessions of the Institute of Gas Managers at Sheffield, Eng., to offer a money prize for the invention of a gas engine that should reach a certain high standard as to quality, while it should be sold at half the price of the gas engines now in market. To the credit of the substantial business men composing the organization, be it said, the projected measure was firmly sat upon.

In a recent issue we announced that a money prize has just been offered for the best means of lighting the Suez Canal by electricity. Had the canal company asked from practical electricians and companies engaged in that line of business proposals for lighting the canal in the regular way of business, its chances of accomplishing the desired purpose would have been decidedly brighter.

Most railroad men know of the offer, made by a humane society a year or so ago, of a prize of $5,000 for an improved method of transporting live stock by rail. Most railroad men are practical enough to realize the absurdity of such an offer. None know better than they that an invention which should fully meet the stated requirements would inevitably, from the force of business causes, come into extended use and bring to the fortunate inventor legitimate rewards, compared with which the proposed prize would be trival.

As a matter of fact, invention is usually a slow process. Its fabric is built up, like the coral islands of the Pacific, by the long-continued aggregate efforts of many workers. These workers are, each for himself, usually engaged in lines of study that bear close relation to their daily business. Long before the advantages of a certain prospective discovery become apparent to the minds of learned prize-offerers, these practical workers have, in most instances, discovered, with the eye of knowledge, the legitimate business rewards that await successful invention. One uses the work of another as the basis from which his labor proceeds, and in due time the desired end is accomplished as the result of the operation of natural causes with which special stimulation has had nothing to do.

How many times have literary displays of a like nature been covered with merited contempt! Does anyone suppose that a real poet, for example, would belittle himself by competing with a horde of rhymsters in a struggle over the artificial rewards attached to a prize poem?

It is seldom that industrial exhibitions pay expenses. Their real value accrues to visitors and exhibitors. Hence it requires a great deal of enterprise to originate one and carry it forward to the satisfaction of the public. The Chicago Railway Exposition receipts amounted to $111,865, and the expenditures to $23,960 more. The total received for general admissions was $61,919, and the largest item of expense was $38,039 for the annex and its maintenance, and the next large item, $17,851, for addition and improvements to main building. Perhaps, if the additions had not been made to accommodate the unexpectedly large number of exhibitors, no deficiency would have been incurred; but then the exposition would have proved less interesting and instructive. The deficiency is less than is usual with an exhibition of such proportions.

The medal manufacturers are getting ready to meet the demand for awards at autumn exhibitions. If the money spent for medals to be given as prizes at fairs were used for improving the exhibitions themselves, both the visitors and managers would be more benefitted.

Keeping Out of Difficulties.

We often hear of the man who displays unusual aptness in getting out of troublesome scrapes, but few sing the praises of the man who don't get into such difficulties. Some one ought to say a word for the man who does not have much occasion to get around avoidable difficulties. The man who always contrives to see that the bolts and nuts are kept tight, that the machine is properly oiled, or that water does not get into the cylinder ought to receive as much consideration as the one who lets the bolts and nuts get loose and the bearings get dry, and then at the last moment works in something brilliant to save a general smash-up. The man who lets the cylinder-head get knocked out and then ingeniously contrives to patch it so as to run in a half-day may be a good man, but how about the one that saves the cylinder-head and the half-day?

The engineer who always has water enough in his boiler; the man who goes right along doing a good deal of work and doing it right, never any trouble with what he does, these are sometimes—not always nor generally, perhaps—the ones that receive the least consideration. Unfortunately there is nothing particularly brilliant in doing the right thing about every time, and the best things when they become commonplace are not always appreciated. There is occasionally a good deal more than there ought to be in being brilliant and a good deal less than there ought to be in being commonplace.

At intervals of a few months the time-honored way of utilizing refuse tin scraps by moulding into sash weights is discovered by somebody and gives rise to a fresh industrial item which travels the rounds of the press. Just now it has been discovered in some New England cities, as noted by several of our exchanges.

It is sometimes up-hill work to get a manufactory of a comparatively new article successfully started in certain localities. Certain kinds of manufacturing enterprises are not welcomed by the people of every community. Imitation butter, commonly known as oleomargarine or butterine until it gets into the retail grocery store, is made in immense quantities and, according to statements of its manufacturers, must be highly beneficial to the corporeal systems of consumers, who imagine they are swallowing real butter.

Out in Washington Territory is the little village of Vancouver, and the people of that place, not being near enough to the centers of science and civilization to keep pace with improvements of the nature of plausible imitations, do not seem to appreciate the advantages of carefully colored extract of tallow as a substitute for butter. The machinery for a new oleo factory recently arrived at Vancouver, but the citizens, instead of giving the concern an acre or two of land for a building site and voting to exempt its property from taxation for ten years, incontinently assembled one night, took the whole machinery and dumped it into the Columbia River. Such little drawbacks as this have a tendency to dampen the ardor of those who go as missionaries to establish new enterprises based upon deception, among the benighted citizens of the territories, but they can afford to wait as the profits are large when arrangements for production and distrbution, under cover, are well perfected.

A number of machinery manufacturers and other readers of the AMERICAN MACHINIST who are sojourning during their summer vacation at country resorts have requested us to change the mailing address of the paper to where they are staying until they return home. This we do willingly. There is no reason why readers of the AMERICAN MACHINIST who go to some place away from the centers of trade to take needed rest should be deprived of their favorite mechanical newspaper for even a single week. The mail reaches about everywhere, and it is easy to drop us a postal card giving the address.

In spite of all the noise made by the enemies of our protective tariff, it is thought by shrewd politicians that no changes of any moment, if any at all, will be made at the next session of Congress. Popular sentiment is known to be so strongly in favor of the protective policy that Congress will hesitate to act against it just prior to the choice of a new administration. Here is where the scheming of partisan politicians will probably benefit the industries of the country.

A report has been going the rounds of technical papers, that the Pennsylvania Railroad Company intended introducing a system of electric lighting over the whole extent of their main track. Every telegraph pole was to be supplied with an arc light, which would illuminate the track and make the use of small lamps superfluous. It was a pretty scheme, but it would have proved enormously costly, and we are authorized to say there is nothing in it.

Shop-owners should read and reflect upon "The Elevator Accident," by F. H. Richards, in the present issue. How many freight elevators in shops are dangerous and likely to cause the death of some one if not made safe? In a large number of shops almost criminal negligence exists in regard to the elevator, both as to its construction and operation.

Literary Notes.

HEAT AND GRAVITY, BY WILLIAM COUTIE, Troy, N. Y.

This little book is issued gratuitously in pamphlet form by the author. It is not in any sense an advertisement of anything. The object aimed at is so clearly set forth in the brief preface that we quote it entire:

"The object of this essay is to prove that the ultimate atoms of all matter constantly give out those actions known as light, heat and gravity, and that they are but different manifestations of the self-same thing, and that the combined action of these primitive acts produces all the other changes we see in nature."

WATER SUPPLY CONSIDERED MAINLY FROM A CHEMICAL AND SANITARY STANDPOINT. By William Ripley Nichols. John Wiley & Sons, New York.

This book is composed from lectures delivered to classes at the Massachusetts Institute of Technology. The importance of properly understanding the nature of water supplied for steam engineering purposes has become better recognized in the last few years than it formerly was. It is a well-known fact that thousands of steam boilers have been ruined, before they ought to have shown indications of wear, through the use of impure water in places where good boiler water was at hand, had the parties in charge only known how to discriminate between good and bad water. The knowledge which is calculated to dispel this expensive form of ignorance will prove of immense practical value. The book is interesting to readers who like to know how waters become contaminated with impurities, and what these impurities generally consist of.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(276) W. S, Chelsea, Mass., asks some questions with reference to proportioning cone pulleys, for answers to which we refer him to the AMERICAN MACHINIST of February 25, 1882.

(277) G. W. M., Akron, Ohio, asks: What is the pitch of a screw? *A.*—The distance from center to center of two adjacent threads. A screw of 100 threads to the inch is 1-100" inch pitch, and so on.

(278) C. K., Camden, N. J., asks: How many units of heat will a cast iron surface 1 foot square and ¼" thick conduct from a hot into a cold liquid for 1° difference of temperature? *A.*—See an article by A. F. Nagle, in our issue of June 9, 1883.

(279) S. J., New York, sends sketch of a trussed roof, and asks questions with reference to the strain upon the several members. For a solution we refer him to the article on "Trusses" in Trautwine's Engineers' Pocket Book. The article in question is too long for reproduction in our columns.

(280) J. N. B., Brantford, Ont., writes: Please tell me some cheap way to take a quarter-inch stream of water from a spring to the top of a hill, the height being sixty feet. There is not sufficient water to operate a ram? *A.*—If you cannot use a ram we know of no other way than to pump it, which will be expensive.

(280) F. S., Philadelphia, Pa., asks: In taking diagrams from a steam engine, is it not necessary to change the motion of the drum in taking from the two ends? *A.*—No, it makes no difference which way the drum moves. It is better not to change the motion, so as to have the diagrams from one end right-handed, as it were, and from the other end left-handed.

(281) J. C. D., Scranton, Pa., asks: 1. What kind of packing can I use to prevent cylinder oil soaking through the joints of a steam chest? *A.*—It is a difficult matter to entirely prevent black cylinder oil from working out in a slight degree at the joint. Joints scraped so as to be quite steam-tight will seldom entirely prevent it. With scraped joints or with joints made with copper, if the bolts are near enough together there should not be leak enough to be serious. 2. How can I find by some simple means the amount of water present in steam? *A.*—There is no simple means of doing this.

(282) A. L. H., Utica, N. Y., asks: 1st. Will you please tell me in your paper why the flange of one pair of drivers is left off some large ten or twelve-wheeled engines? *A.*—The flanges are left off to enable the engines to go round curves easily. An engine with a long wheel base could not go round even a moderate curve with flanges on all the wheels. 2d. Will an ordinary Mack injector feed as much water as a pump, on a locomotive? *A.*—An ordinary injector on one road differs from the ordinary injector on another road. An injector of the proper size for feeding a locomotive will throw as much water as an ordinary pump.

BUSINESS SPECIALS.

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

James W. See, Consulting Engineer, Hamilton, O.

Presses & Dies, Ferracute Mach. Co., Bridgeton, N.J.

Mechanical and patent drawings on short notice. W. G. Chapin, 305 Nostrand avenue, Brooklyn, N.Y.

Patents.—Franck D. Johns, Att'y at Law & Solicitor of Patents, 617 Seventh St., Washington, D. C.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Latest and best books on Steam Engineering. Send stamp for Catalogue. F. Keppy, Bridgeport, Ct.

Wood Engraving done in best manner. Designs furnished. Edward Sears, 48 Beekman St. New York

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Steam Economy—124 pp., in boards. By mail, $1. A. Wilkinson, Manayunk, Pa.

Universal grinders for lathe-centers, chucks, angles or cylinders. C.C. Hill, 144 La Salle st., Chicago, Ill.

Chas. T. Porter, Mechanical Engineer, Tribune Building, (Room 42,) New York City.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

For sale, 25" lathes of best designs from new patterns. George A. Ohl & Co., E. Newark, N. J.

Parties desiring 18" engine lathes will find it to their advantage to correspond with James A. Fuller & Co., 3 Cyprus street, Worcester, Mass.

William J. Baldwin, consulting engineer in Steam Heating and Ventilation. Author of "Steam Heating for Buildings." Office, 96 Fulton st., New York.

Castings furnished for 18" and 21" swing engine lathes. Gearing turned and cut if desired. C. F. Batt, Phœnixville, Pa.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

How to reach 40,000 prominent "*Steam Users*" in the United States. Send for our circular. The J. N. Mills Publishing Co., 145 Broadway, N. Y.

Young men wishing to take a mechanical course or learn the machinist's trade, call or address School of Mechanical Instruction, No. 195 Front street, Worcester, Mass.

"Patent Binder" for the AMERICAN MACHINIST holds 52 weekly issues in good shape. Sent to any address by mail for one dollar. American Machinist Publishing Co., 96 Fulton street, New York.

The Complete Practical Machinist, $2 50; the Pattern Maker's Assistant, $2.50; Mechanical Drawing Self-taught, $4 00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

Reed's Sectional, Removable Steam Pipe and Boiler Covering. Send for circular and prices to C. C. Cowpland & Co., No. 744 Broadway, New York. agents for the States of New York and Northern New Jersey.

Wanted—Correspondence with engine builders, boiler makers, and supply dealers in steam goods. We manufacture the *cheapest* Injectors and best Steam Jet Pumps in this country, and offer to *live men* the most liberal terms ever named. Drop postal for particulars to J. B. Sheriff, Son & Co., 68 Water St., Pittsburg, Pa.

The "Lancaster" new patent tools, viz., Screw Plates; Pipe Cutters, with and without Burr Scrapers; Wrenches; Pipe inside Burr Reamers; Drill Chucks; Combined Punch, Shears, Anvil, and Rod Cutters, &c.; all newly designed and highly efficient. For agencies, illustrated circulars, and liberal discounts, apply to Lancaster Mfg. Co., 36 Dey st., N.Y.

BOUND VOLUMES of the AMERICAN MACHINIST for 1880, 1881, and 1882. A limited number of each sent by express for $4 per volume, express charges to be paid by purchaser. AMER. MACHINIST Publishing Co., 96 Fulton st., New York.

Chordal's Letters.—John Wiley & Sons, 15 Astor Place, New York, have now ready a new and enlarged edition, with six additional plates, of Chordal's Letters, comprising the choicest selections from the series of articles entitled "Extracts from Chordal's Letters," which have appeared in the columns of the AMERICAN MACHINIST; with a steel portrait of the author, and upwards of fifty original illustrations by Chas. J. Taylor. One volume 12 mo. of nearly 400 pages, cloth, $2.00. Will be mailed and prepaid on the receipt of the price.

Credits.—Ealy's "Blue Book," July, 1883, just published, contains a complete classified list of over 100,000 names of machinists and dealers in machinery, railway machinists, engine and boiler makers' supplies, brass goods, metal, etc., in United States and Canada. The book is condensed making it much more convenient to handle than a larger agency book. It gives the financial standing and paying qualities of all dealers and manufacturers in the above-mentioned lines of trade. For terms, etc., address The John W. Ealy Company, 51 Chambers street, New York, or 79 Dearborn st., Chicago, Ill.

MANUFACTURES.

A thimble factory is to be started at Woodbury, N. J., by Guild & Gebhard.

An iron foundry called La Reforma has been established in Santa Cruz, Mexico.

The machine works of Forbes & Curtis, at Bridgeport, Conn., will be enlarged shortly.

The Grand Trunk Railway are about to erect additional workshops at Point St. Charles, Quebec.

The Combined Patents Tube Company, Philadelphia, has been chartered with a capital of $50,000.

R. M. McBeth & Co. have just started a shop at 183 Pearl street, Cincinnati, O., to manufacture drills.

The Oneida (N. Y.) Knitting Mill is a new establishment about ready to start manufacturing hosiery.

The Western Nail Works, Belleville, Ill., has lately added a new grindstone house and machine shop, 34x100 feet.

The Tyrone Iron Manufacturing Company, Tyrone, Pa., have decided to erect furnaces, rolling mills and machine shops there.

A. B. Lawther, Chicago, Ill., has just placed in his works an improved lathe which swings forty-eight inches and turns twenty-six feet.

Cleveland furnishes the boiler plates for a new 105-ton locomotive now being built in the Central Pacific Railroad shops at Sacramento, Cal.

The Pullman Palace Car Company has ordered $130,000 worth of machinery for the new works at Pullman, Ill., from J. A. Fay & Co., Cincinnati, O.

P. W. Reinshagen succeeds Reinshagen & Buckman as proprietor of the Queen City Machine Works, Cincinnati, O. The works build engine lathes.

Palmer, Mass., expects to have a wire-cloth manufactory located there, by Worcester parties, provided the citizens subscribe $1,500 towards the enterprise.

The building of the new Aurora Cotton Mills, at Aurora, Ill., will be 100x336 feet and four stories high. Capacity, 20,000 spindles. Its erection will be pushed rapidly.

The Brownell & Wight Car Company, St. Louis, Mo., are making additions to their blacksmith shop which, when completed, will give them a capacity of twelve cars a week.

The French Spiral Steel Spring Company, Pittsburgh, Pa., are building a large new works between Twenty-fourth and Twenty-fifth streets, on Smallman, 300 feet long and 75 feet wide.

The Industrial Ironworks Company, of St. Louis, Mo., are putting in a large quantity of new machinery and are making arrangements to increase their capital stock.

Korting exhaust steam induction condensers have just been furnished to the Empire Oil Refinery, Long Island City, L. I., and Laurel Hill Chemical Works, Blissville, L. I.

The Buckeye Engine Company, Salem, O., has shipped a 56x30 engine to the Hartman Steel Company, Beaver Falls, Pa., and will ship shortly two more nearly as large to the same company.

The *Des Moines* (Ia.) *Trade Journal* says: "So many car loads of heavy freight are coming into Des Moines that a crane or half a dozen of them would command constant use. Next to the elevator give us a crane."

Lodge, Barker & Co., Cincinnati, Ohio, manufacturers of lathes, have removed to their new iron building northwest corner Sixth and Eggleston avenue, the ground floor of which covers a space of 11,000 square feet.

The Delamater Iron Works Company, of New York, have two ice-making machines almost completed for a firm in this city. They expect to commence work directly on an order of large ice-making machines for China.

The Excelsior Foundry and Plating Company, of St. Louis, has been incorporated, with a capital stock of $20,000. President, R. H. Tevis; secretary and treasurer, C. J. Linberg; superintendent, Thomas D. Rohan.

The new blast furnace of the Alice Iron Company at Birmingham, Ala., which went into blast July 25, is the largest furnace in the State, and, with one exception, the largest in the South. It is expected to make ninety tons of iron a day.

Girard College is putting up a building for technical instruction, to be two stories, 150x50 feet, with boiler-house attached. The College also proposes to increase its boiler capacity for heating. Three or four new boilers will be required.

The capacity of the Union Machine Shops, St. Louis, Mo., will be slightly enlarged by the erection of an addition 75x35 feet, now under the bricklayer's hand. The new addition will be used as a department for light work.—*Age of Steel.*

John Reippel, an ingenious mechanic and gang foreman in the Pennsylvania Railroad shops at Renovo, Pa., writes us that he intends going into business on his own account by starting a small machine shop and foundry at Gaines, Tioga Co., Pa.

A Pennsylvania firm is erecting at Johnson City, Tenn., what is said will be the largest tannery in the world. The building will cover several acres, and the vats will be on an extensive scale. The supply of oak bark is said to be almost inexhaustible in that section of East Tennessee.

Business is quiet with E. W. Bliss, of Brooklyn, N. Y., but a full force of men is employed on the firm's specialties of dies and stamping machinery. Several rotary engines have just been completed, and some shop tools are in course of construction. The firm is getting out a new catalogue.

The citizens of Oldtown, Maine, have urged the Edwards Manufacturing Company to erect a cotton mill in that town, and as an inducement to build it, the citizens, by a vote, have agreed to exempt the company from all taxation for a period of ten years. The company hold the offer under advisement.

William Taylor & Sons, of the Columbian Iron Works, Brooklyn, N. Y., are working day and night on cotton seed oil machinery, mostly for the Southern States. The demand for this kind of machinery appears to be particularly urgent, and is a healthy indication of prosperity in that growing industry.

The firm of Henry R. Worthington, New York, report business good, with 630 men at work in their shops. The firm have opened a branch office in San Francisco, and have just issued under date August 1, 1883, a handsome 36-page catalogue, containing illustrations of the pumping machinery manufactured by them.

The Union Chain Works of Reiter & Co., Pittsburgh, Pa., have been removed to Allegheny City. They are building a shop, size 35x80, 20 feet high. The link and machine shop is 50x90, 20 feet high; welding shop, 40x30, 20 feet high; office, 50x50, two stories. They will employ about 75 hands when they commence running.

The Bramble Lock Company have erected at Terre Haute, Ind., a new three-story brick shop, 35x100 feet, with engine and boiler-house in addition, in which to carry on the manufacture of railroad, bank door, and the better class of locks. A. B. Holmes, formerly with the Tewksbury Elevator Company, will be superintendent of the works.

A fine new foundry and machine shop is being erected by R. M. Eddy, 40x60 feet in area and four stories high, at Nos. 45 to 53 Indiana street, Chicago, his business, though conducted in a very quiet way, having entirely outgrown the capacity and facilities of the wooden shop hastily erected after the fire, on the corner of Franklin and Illinois streets.—*Western Manufacturer.*

Joseph Radcliffe writes us from Glen Rock, Pa.: An effort is now making to organize a stock company in this town, with a capital of $40,000, to manufacture steam engines, boilers, and agricultural machinery. $35,000 of the amount is subscribed. It is proposed to transfer to the new company the car and machine shops of Fry, Herbst & Co. for $18,000, this amount to be taken in stock.

Kewanee, Ill., is to have a rolling and pipe mill for the manufacture of bar iron, and wrought-iron steam and gas pipes. Five acres of land adjoining the Haxtun Steam Heater Works has been donated by the business men of Kewanee to the new concern, at a cost of $20,000, as a site for the works. Work will be commenced on the buildings at once, and pushed to completion at the earliest possible day.

A. M. Powell & Co., Worcester, Mass., are making a special lathe for turning up emery wheels, which swings 36" over bed. It is a heavy and powerful tool. They are having a good demand for 16" and 26" lathes, also for 19" lathes. They have a screw 31 feet long and 2⅝" diameter, from which to cut their lead screws. This screw was cut in sections very carefully, and shows no error at the temperature at which it was cut.

John Robertson & Co., Water street, Brooklyn, are making a hydraulic machine for an English firm, to be used in the manufacture of plug tobacco. They have recently shipped several machines to Pittsburgh, Cleveland, and Buffalo for making electric light carbons. They have several lead pipe machines in various stages of construction, and sufficient work is coming in to keep the men going, but business is not brisk.

The Pennsylvania Combustion Attachment Company has been incorporated in Philadelphia, to make and apply the Orvis combustion attachment and smoke consumer to steam boiler furnaces. This device, it is claimed, effects the economy of fuel and consumption of smoke and gases. R. B. Swain is president; John S. Stevens, treasurer; Chas. Perkes, secretary, and L. B. Eaton, general agent. Capital stock, $100,000. The company's office is at 154 South Fourth street.

The *New York Times* says: "A new brick building, 150x78 feet in dimensions, is being erected at Sing Sing Prison for foundry purposes by Perry & Co., who find their accommodations at present too contracted to fill their orders. A large number of citizens will be given employment in this building when completed, which will probably be in September next." As the contract of Perry & Co. calls for the labor of 900 convicts at 56 cents a day each, in stove making, the "large number of citizens" will probably not receive very large wages.

In addition to the two floors formerly occupied by E. E. Garvin & Co., 131 Centre street, New York, since May 1 they have fitted another floor 70x70 feet with machinery, which has added largely to their capacity for building machine tools. They have 125 men at work, and are shipping machines about as fast as they can be turned out complete for use. While passing through their shop one day last week, we noticed a new milling machine, nearly finished, which will take two cuts at once upon the arm of a sewing machine, also a new small automatic milling machine with lever motion and power feed. They have recently made some changes in their one-spindle edging machine.

A big enterprise in Alabama is that of the Lady Ensley mining and manufacturing company, capital, $800,000, to be organized for the purpose of developing rich iron and coal lands, and the erection of blast furnaces thereon. The company own 75,000 acres of the finest mineral lands in North Alabama. The company will not confine its operations to coal and ore mining, but will build two large blast furnaces near Russellville, where they will have ample water power to run all the machinery around the furnaces. The furnaces and mines will be directly on the line of the Birmingham & Northwestern Railroad. A branch line is being surveyed to the Tennessee River, near Florence, which will enable them to ship their products by steamers to New Orleans, St. Louis, Cincinnati, and even to Pittsburgh.

The *Boston Commercial Bulletin* says: "One of the most important features in Stoneham, Mass., is the co-operative shoe manufacturing concerns, which are a decided success, and have prospered beyond anything of the kind ever before started. There are three separate co-operative shoe shops here, and the method of conducting the business is about as follows: The workmen are the stockholders of the entire business, and each workman can hold not over four shares of stock at $250 per share. One man is elected president, and is the foreman or superintends the business. The president receives a salary of $1,500 per annum, and the workmen receive weekly wages, and a dividend on their shares of stock, which last year in one shop was 25 per cent. per share, and in this same shop the average dividend for five years was 20 per cent."

Annin & Co., Water street, Brooklyn, N. Y., are fitting out a complete equipment of machinery for the manufacture of iron wheel-barrows and steel hand-trucks. Strong dies have been made which stamps out the various parts of the wheel-barrow, all the rivet holes being punched in the same operation. The bottom, which is generally found to be the weak point of iron wheel-barrows, is made twice the thickness of the sides. The frame is of iron piping prepared by a special process, and very strong. No bolts or rivets are used on the frame. The hand-trucks are made from steel piping, which forms the frame and handles. The bale which carries the load and has the wheels attached is also of steel, and is shrunk on to the pipe frame. All the operations in the manufacture of the truck are performed by the machinery. It is 35 pounds lighter than a wooden truck of the same capacity, and its strength is much greater.

Machinists' Supplies and Iron.

NEW YORK, August 9, 1883.

The feeling of both manufacturers and dealers is that there is a slow but perceptible improvement in business.

Fay & Scott, Dexter, Maine, have an illustrated catalogue of machine tools made by them.

The Geo. F. Blake Manufacturing Company, 95 and 97 Liberty street, New York, and 44 Washington street, Boston, are sending out a new catalogue of steam pumps and pumping engines, in which their products are shown by some excellent cuts. This catalogue has also five pages devoted to useful information on steam and water, and contains tables, data, etc., of interest to engineers and machinists.

In iron we quote: No. 1 X Foundry, standard brands, at $22 to $23; inferior brands, $21.50; No. 2 X, $19.50 to $20.50 at tide-water. Scotch Pig is fairly steady, with prices: Coltness, $23.75 to $24; Glengarnock, $23; Gartsherrie, $23.50; Summerlee, $23 to $23 50; and Eglinton, $21 to $21.50.

Antimony is in moderate demand. We quote: Hallett's brand, 9¼c. and 9⅜c.; Cookson's, 10¼c. and 10⅜c.

The demand for Copper is light, with Lake at 15⅛c. to 15¼c.; Baltimore, 14c. and 14¼c.

Lead, 4.25c. to 4.30c., with limited transactions.

Tin has been in moderate demand in jobbing lots, and is held firm, at 25c. for Banca, 21½c. to 21⅝c. for Straits and Malacca.

In Spelter sales are small, but quite numerous. Common Domestic sells at 4.40c. to 4.70c.; Refined, 8c. to 8¾c.; Silesian, 5c. to 5⅛c

Boiler Plate sells as follows: Tank, 2⅛c. to 2¼c.; Refined, 2¾c. to 3c.; Shell, 3¼c. to 3½c.; C H. No. 1 Flange, 4¼c. to 4½c.; extra Flange and Fire Box, 5¼c. to 5½.; Siemens Steel Plate, 5½c. to 6c.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue

Wanted — Address of small broom handle or round roller maker. Box 1181, Plainfield, N. J.

Wanted—A good draughtsman on machinists' tools. The Hendey Machine Co., Torrington, Conn.

A young draughtsman wants a situation. Address Box 5, AMER. MACHINIST office.

Wanted—Immediately, at Huntington, West Va., an experienced brass moulder. Address, with reference and terms, the Ensign Manufacturing Co.

Mechanical engineer and draughtsman, lately employed in the elevator business, wants engagement. Address P. O. Box 920, Yonkers, N. Y.

Wanted—Situation, by a competent iron foundry foreman; has had charge twenty-five years. A good workman and economical manager on all kinds of machinery. Address Box 7, AMER. MACHINIST.

An Eastern man, with ten years' experience as foreman and superintendent in the manufacture of Wood-Working, Woolen, and Printing Machinery, would like a position. Parties building machinery, who would like to adopt the apprentice system on a large scale, would find it for their interest to answer this. Address B, care AMERICAN MACHINIST.

Wanted—A pattern and model maker. One who knows what first-class work is, and can do it. Must be able to do a good job in either wood or metal. Must be well fitted, both by nature and experience, to build complicated machinery. Must be strictly sober and reliable. To the right kind of man I can give steady employment and good pay. Sterling Elliott, Newton, Mass.

Light and fine interchangeable machinery to order. Foot and power lathes; slide rests, &c. Catalogue for stamp. Edwd. O. Chase, Newark, N. J.

Wanted—A partner with about $5,000, in a small machine shop and foundry within 10 miles of New York. A mechanic preferred. Address, Box 2, AM. MACHINIST.

For immediate delivery, 16″, 18″, 25″ and 26″ swing engine lathes from new patterns, combining all the best improvements, at exceedingly low prices. For cuts and prices, address J. B. Reed, Cairo, Ill.

For Sale—Foundry, machine and blacksmith shops in the most live town in Southwest Iowa. Good shipping to Kansas, Nebraska and Missouri. Manufacture steam engines, house and railroad castings. Only small capital needed. Terms easy. Address, Iowa, care AM. MACHINIST.

For sale.—One-half or whole interest in Canadian patent that has netted inventors with $500 capital $50,000 in six years in the U. S. Reasons for selling, no time to develop Canada. To verify above statement, books open for examination. Address, with references, Edward Taggett, Grand Rapids, Mich.

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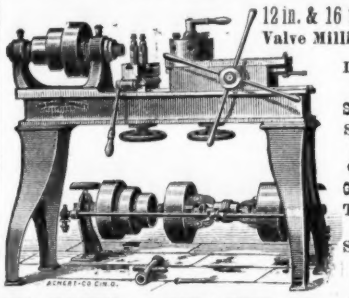
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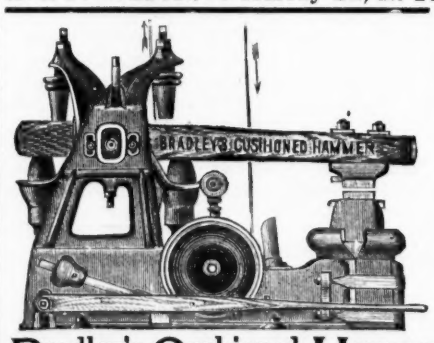

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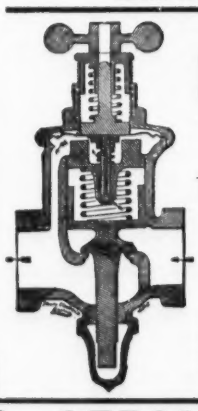
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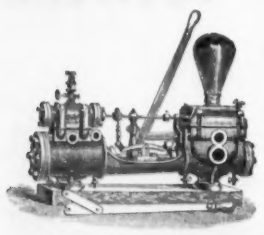
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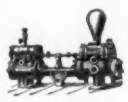
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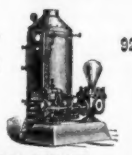
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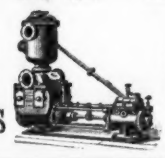
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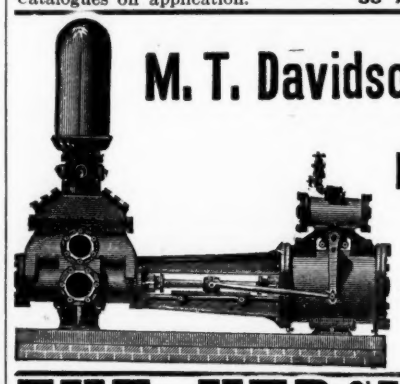
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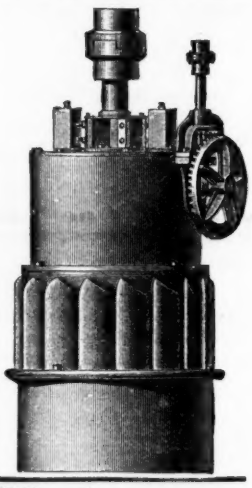
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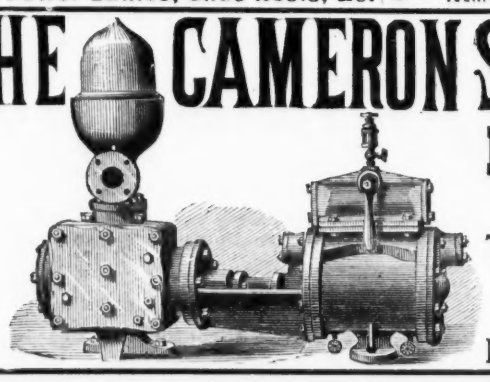
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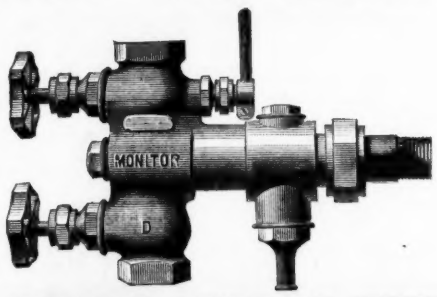

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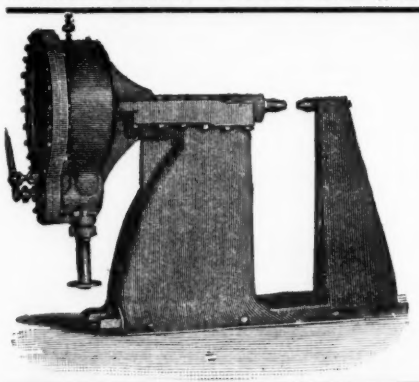

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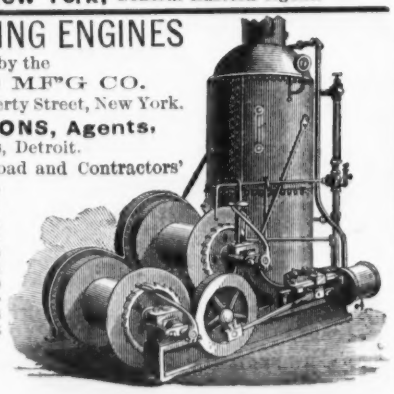

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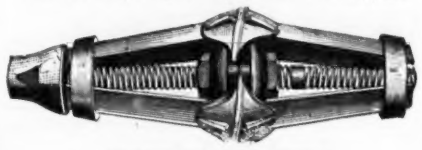

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" 9	1 3-8 "	1.10
" 10	1 1-2 "	1.10
" 11	1 3-4 "	1.25
" 12	2 "	1.40
" 13	2 1-4 "	1.60
" 14	2 1-2 "	1.60
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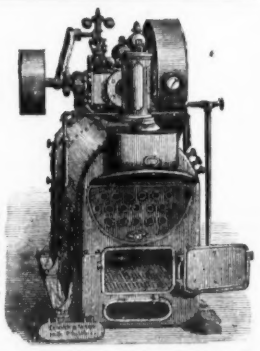

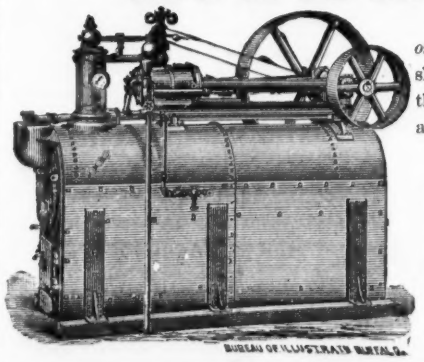

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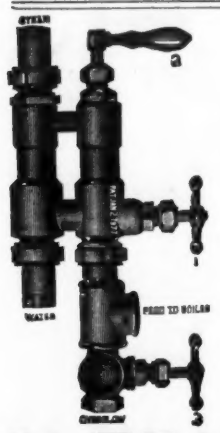

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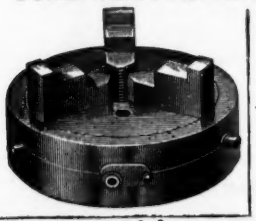

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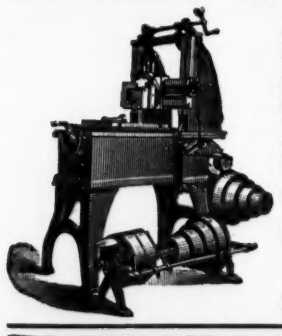

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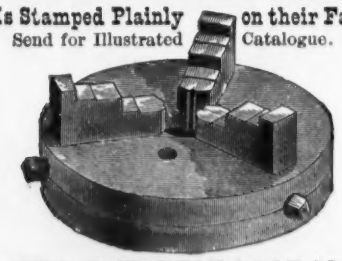

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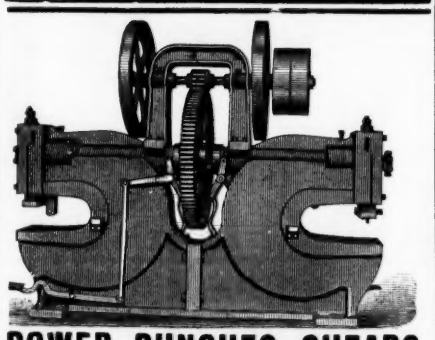

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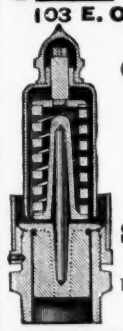

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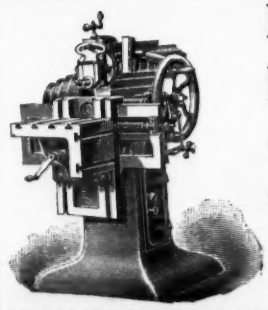

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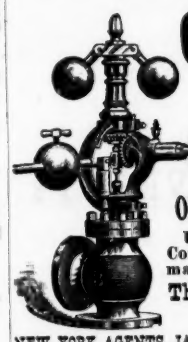

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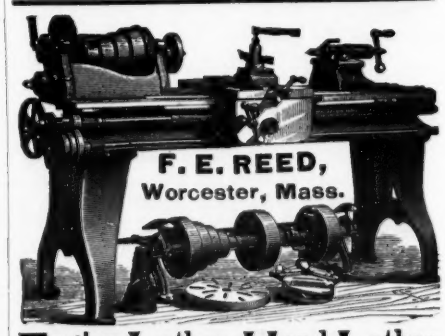

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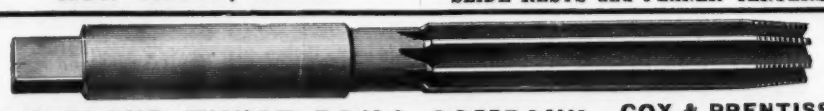

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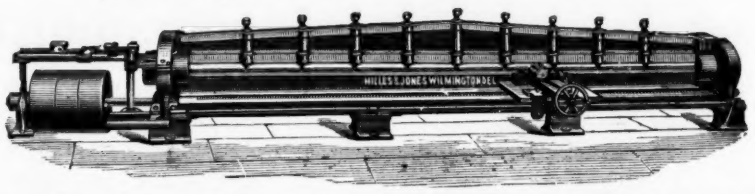

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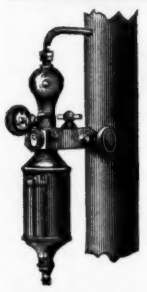

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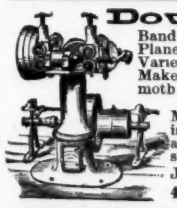

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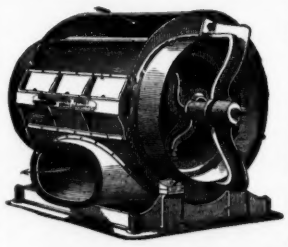

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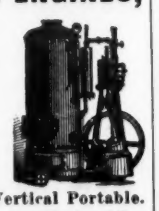

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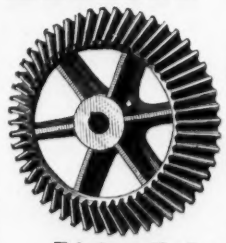

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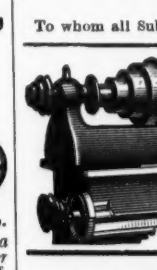

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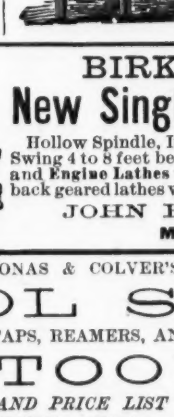

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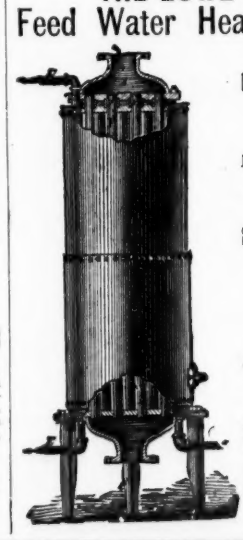

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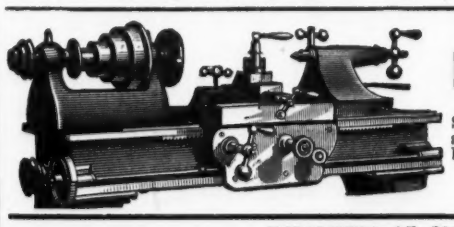

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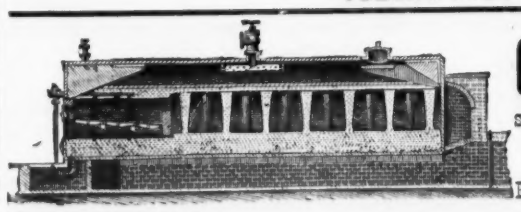

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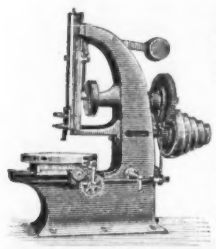

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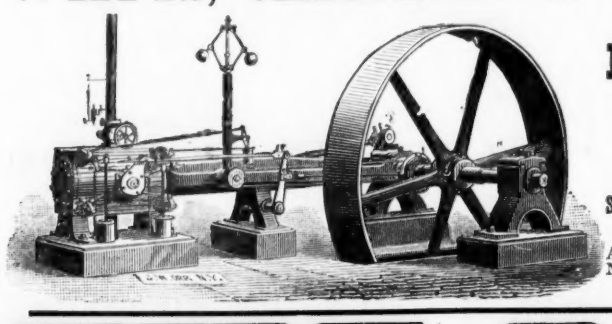

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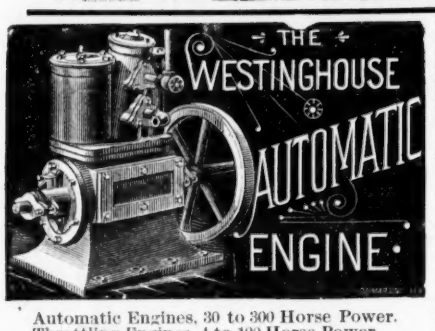

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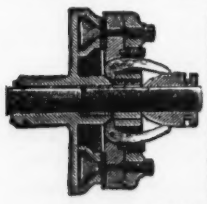

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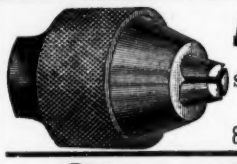

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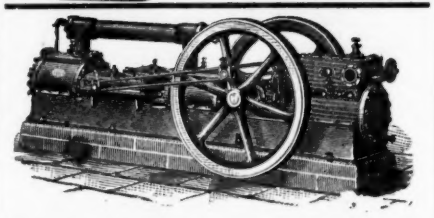

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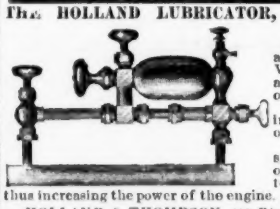

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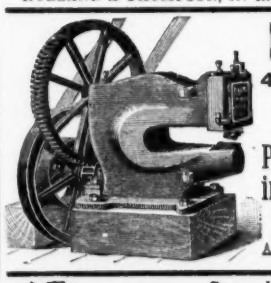

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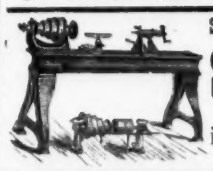

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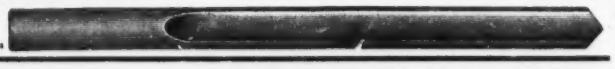

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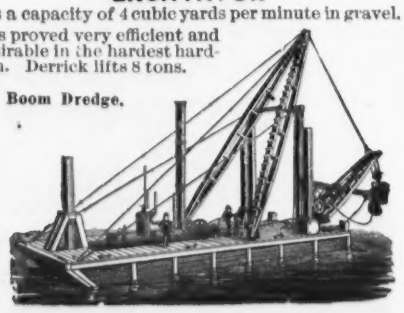

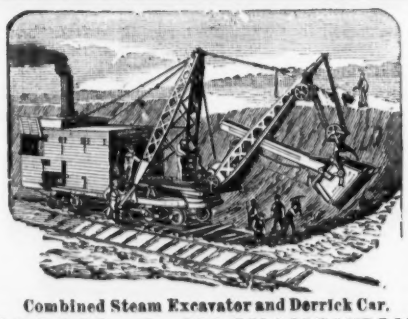

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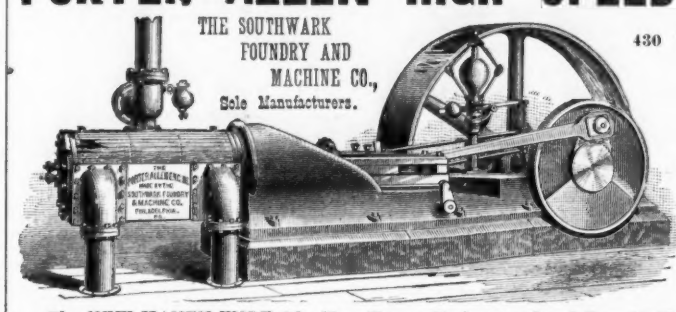

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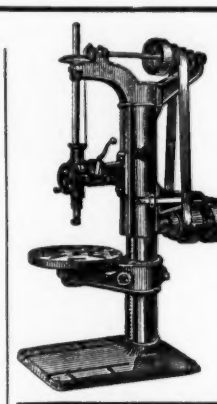

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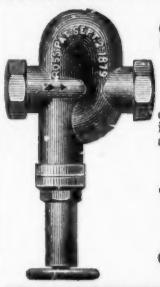

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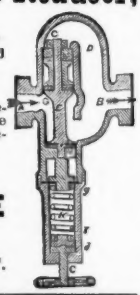

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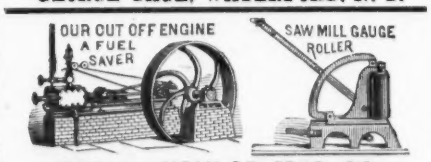

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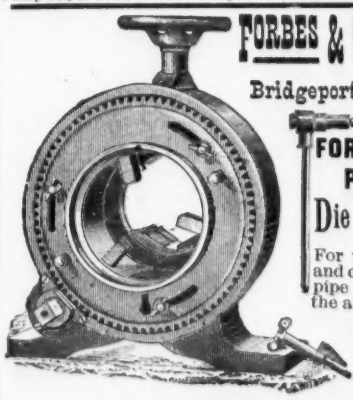

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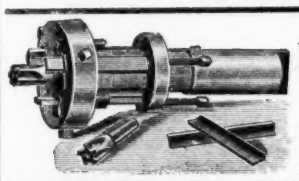

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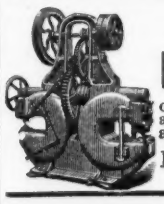

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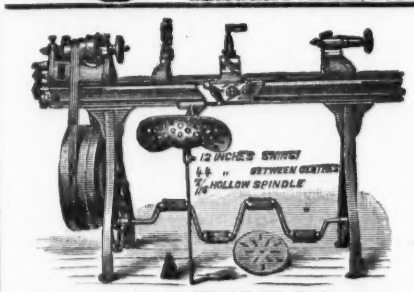

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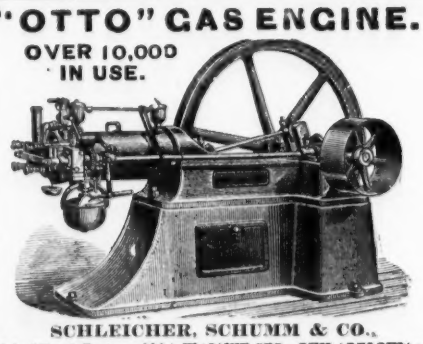

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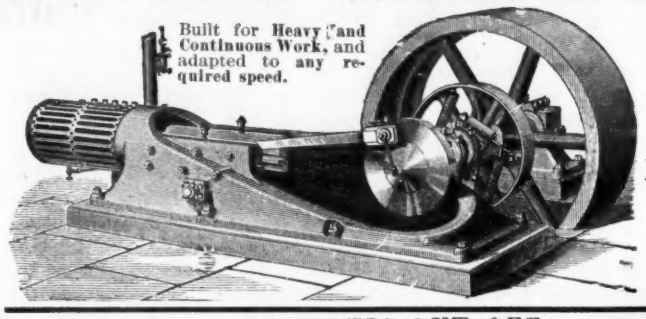

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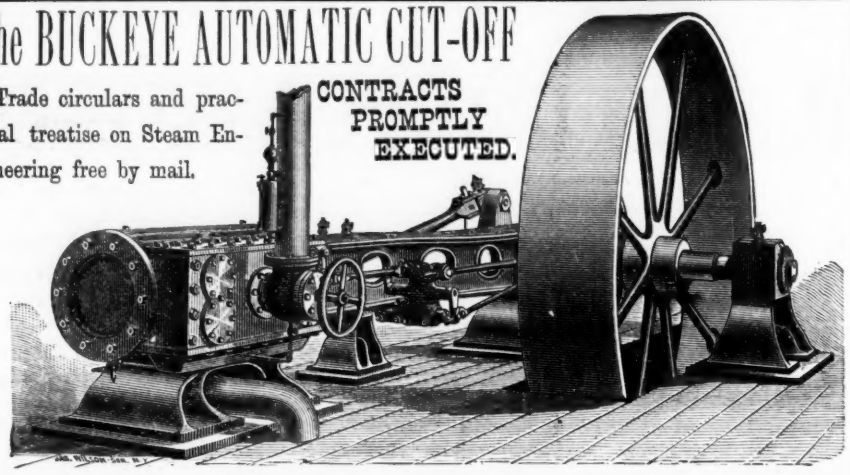

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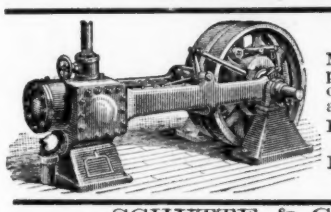

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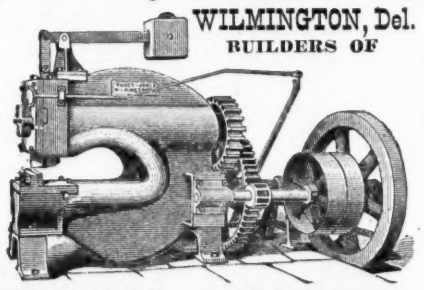

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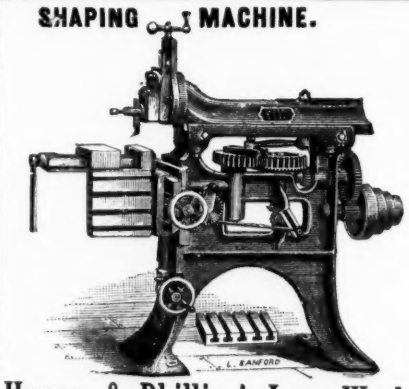

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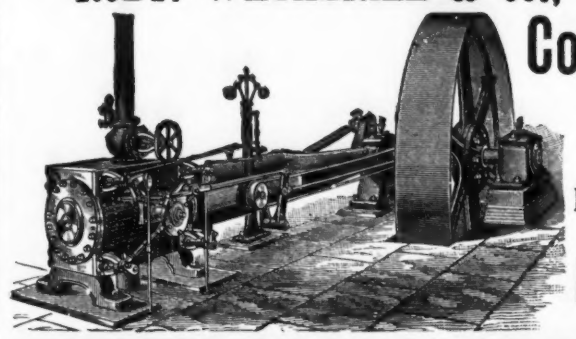

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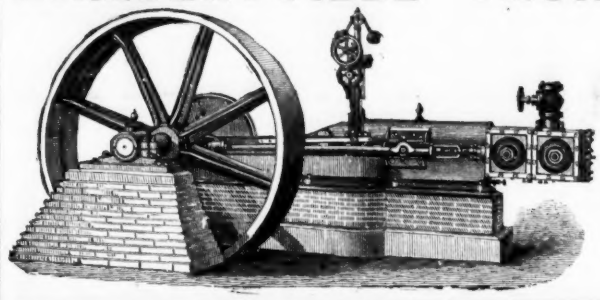

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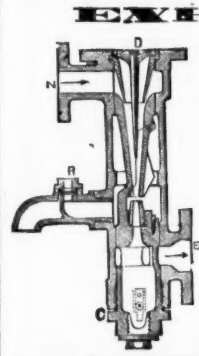

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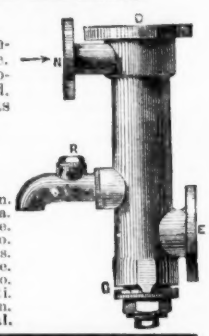

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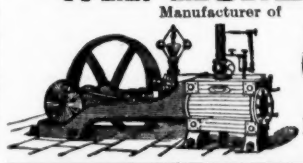

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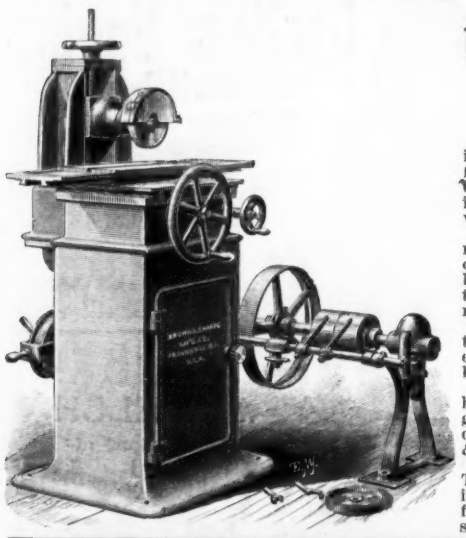

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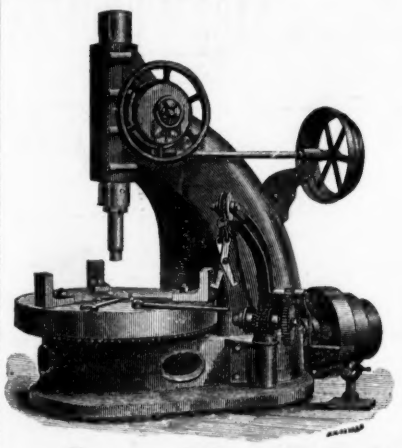

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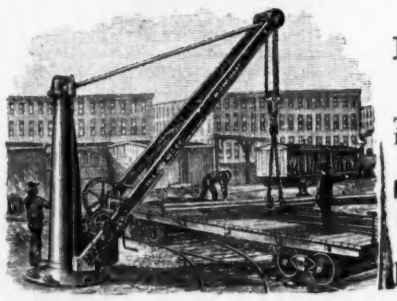

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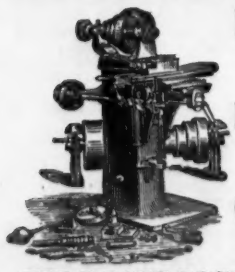

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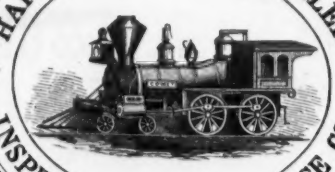

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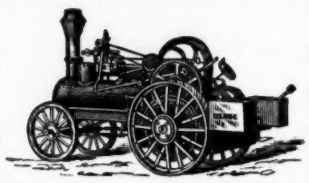

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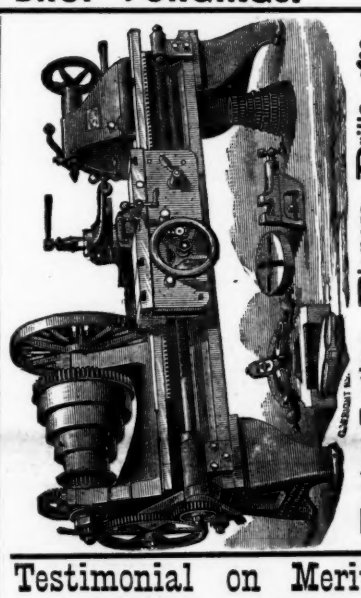

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